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ABSTRACT

In an attempt to draw together significant materials on elementary school industrial arts, 26 journal articles, addresses, chapters of books and instructional materials, dated from 1923 to 1967, are reprinted in Section I "Philosophy, Objectives, Curriculum, and Methodology" and Section II "Implementation of Industrial Arts in Elementary School." Section III "Selected Resources for Elementary School Industrial Arts" includes resources describing educational exhibits, construction, and teaching units. Additional references are listed covering curriculum, units of instruction, activities, and materials. (DM)

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ELEMENTARY SCHOOL INDUSTRIAL ARTS:

Selected Readings and Resources

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PREFACE

The book sections, articles, and resources presented in this notebook insert, represent an attempt to draw together some significant materials on elementary school industrial arts. We believe that they represent some of the better materials available. It is hoped that making this material available will stimulate additional interest and effort to introduce children to the fascinating subject of industry and technology.

The materials presented are representative only, and are not meant to indicate that other excellent materials are not extant. The limitations of space and cost precluded the inclusion of other worthy works on the subject. In addition, a number of references felt to be of value are documented at the end of various selections while other recommended references and resources are identified in Section Three of the insert.

An attempt has been made to convey the idea that one starts with a philosophy, develops objectives and only then gets to the nuts and bolts of structuring a curriculum and curriculum components. Bonser's work is notable in that he was a psychologist rather than an industrial arts person. It is felt that his writing represents fundamental thinking with regard to elementary school industrial arts, even though the work in collaboration with Mossman was copyrighted in 1923.

The notebook insert was developed to serve a number of purposes. Some of the major functions for which it was designed are:

1. It provides some selected reading materials for students on our campus.
2. It compiles an eclectic grouping of materials within one binding.
3. It preserves several writings which are now out-of-print.
4. It presents selected instructional idea sheets.
5. It identifies some ideas for units of instruction in communication, construction, management, manufacturing, power, and transportation.
6. It lists selected references for curriculum, units of instruction, and activities.
7. It enumerates a number of sources for classroom learning materials.

It is believed that the selections presented may be helpful in the teaching efforts of elementary school and teacher education personnel. It should be noted that this field is in its infancy, or at best, in early childhood. This effort may at least be additive to the work that has and is being done. In addition, it may serve as a point of departure.

The editors wish to express their appreciation to all those whose writings are presented in this consortium. The generous cooperation of the publishers, professional organizations, estates, and the California State Department of Education, have made the task that much easier. In some instances, requests to publishers to reprint materials, brought responses that the authors also needed to provide their permission. The prompt responses of these individuals was also gratifying.

The editors are indebted to several authors who gave their consent to have examples of their published works reprinted. These individuals, listed in alphabetical order, are Duane G. Chamberlain, Alexander Frazier, Robert W. Haws, Carl J. Schaefer, and Harold G. Shane. Duane G. Chamberlain was responsible for many of the resources, presented herein, which were developed within the Department of Industrial Education, Eastern Michigan University.

Special thanks are extended to Mrs. Virginia Bonser Brooks and to Niles R. Mossman represented by Elizabeth M. Drysdale, Attorney in Fact.

Members of The Department of Industrial Education, who assisted in the preparation of this material in many significant ways, included Robert A. Benden, Carroll A. Osborn and H. James Rokusek. The competence and indulgence of Carol I. Barnett, the Departmental Secretary, was noteworthy. The wholehearted support and encouragement of Raymond A. LaBounty, Department Head, was appreciated and facilitated the completion of this venture.

Bibliographic information is included on the first sheet of each published selection with the exception of one, in which case the author and source are unknown. The publishers who consented to have their materials reprinted are acknowledged below in alphabetical order:

American Industrial Arts Association

American Technical Society

Bruce Publishing Company

California State Department of Education

National Education Association

Silver Burdett Company

Teacher Education and Professional Standards Commission

Teachers Publishing Corporation

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Delmar L. Larsen
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ELEMENTARY EDUCATION OBJECTIVES*

Objectives

Changes in American life since 1900 have created a number of mutations in the objectives of elementary education. The schools attended by our grandparents or great-grandparents sixty-five to seventy-five years ago generally sought to provide a rudimentary classical education, to preserve and strengthen established moral-religious values, and to help children attain the level of literacy and skill needed for social and vocational competence in the nineteenth century.

By 1920, as our culture changed rapidly, an increasing number of elementary teachers were making what Lawrence A. Cremin has called "a many-sided effort to use the schools to improve the lives of individuals." As a result, elementary education became more concerned with children's total development, with family-community life, and with the application of scientific research that had a bearing on teaching and learning.

Greater attention also was given to the problems that stemmed from an increased awareness of human differences and individuality in the increasingly complicated social environment that we were creating.

As goals for the elementary school broadened in the 1920's and 1930's, it became apparent that there was a deepening split between the proponents of traditional and of modern practices. During this twenty-year period, William C. Bagley, and eloquent advocate of "fundamental education" and William H. Kilpatrick a major spokesman for "progressive education," symbolized the schism that developed.

In the early 1950's, viewpoints on what the elementary school should seek to accomplish remained a mosaic of conflicting opinions, and a decade of great debate was well under way. Even now the arguments continue to be lively ones, and as Adler and Mayer phrased it, "The traditionalist accuses the modernist of assuming that the world began yesterday, and the modernist accuses the traditionalist of assuming that it ended a century or two ago.

After prolonged and heated discussion, just where are we now, with respect to objectives for elementary education?

Trends in educational practices suggest current directions. The true expression of an individual's goals resides in what he does rather than what he says. If this maxim be applied to elementary school objectives, it would appear that many persons working in the first six or eight grades--perhaps because of changed thinking resulting from the debates in the 50's--have become convinced that some important aims associated with traditionalist or fundamentalist education had been neglected.

*Reprint of Shane, Harold G., "Elementary Education Objectives," NEA Journal, LI (September, 1962), pp. 41-43.

To phrase it more bluntly, in the last three to five years there has been a distinct trend toward an intellectual or cognitive emphasis in elementary instruction and some withdrawal from the pronounced social emphasis associated in the public mind with the label "modernist" or "progressive."

A recent article by William Van Til makes the point that American education "is engrossed with the application of technology to education, with competing new proposals for organization of the school program," and with "updating knowledge through efforts by specialists in the disciplines."

This new preoccupation with technology, structure, and content reflects a departure from the extreme modernist position of the 1930's, when the orphic statement, "We teach children, not subjects," was familiar.

Van Til's list of three emphases suggests a current search for the means of achieving more learning in less time, a concern for organizational devices that provide superior machinery and techniques for recognizing human differences, and a quest for advice from specialists with respect to content in the sciences, in the humanities, and in other fields.

What does the freshened interest in and trend toward more intellectual, educationally oriented programs suggest with respect to elementary school objectives?

If it is true--as certainly seems to be the case--that the aims of elementary education have become more forthrightly academic, does this increased intellectual emphasis threaten sound practice? Several points seem relevant.

First, and obviously, there is nothing inherently wrong with a judicious increase in the tempo of attempts, through education, to improve the intellectual powers and extend the information of children. Any argument to the contrary is fatuous.

Second, there is a real and present danger that elementary teachers may become so mesmerized by the magic of technology, the appeal of novel grouping plans, and the respectability of more challenging content that they overlook the fact that these elements are means rather than ends in education.

The use of technology, for instance, is not a goal. It is a procedure in attaining a goal. Even mastery of content per se is relevant to aims only as it motivates the child to continue his education and to use his knowledge. In Alfred North Whitehead's well-known phrases:

> Culture is activity of thought, and receptiveness to beauty and human feeling. Scraps of information have nothing to do with it. A merely well-informed man is the most useless bore on God's earth. What we should aim at producing is men who possess both culture and expert knowledge in some special direction.

Third, increased interest in the goal of enhanced academic achievement should be characterized by teaching that is stimulating and challenging rather than merely harsh and onerous. Standards are not improved by requiring that pupils engage in increased busywork. There is little or no point in their doing busywork in the first place.

Fourth, it is incongruous for elementary education to seek to improve itself by an all-out effort to ape the programs and practices of the junior or senior high schools. Such mimicry is not only foolish but ironic as well during a time when secondary school teaching is being influenced by instructional policies and by research in learning which were initiated in the elementary school.

Certain established objectives of elementary education should be preserved. Changes in the education climate of the United States, as already noted, have generally reaffirmed devotion to intellectual growth and indicated the vitality of the school's concern for basic skills, problem-solving ability, and rational thinking. These are goals of long standing that merely have been restated with vigor. Plainly, they are worth preserving.

Other oucomes that merit our best efforts include the following durable goals: improved physical health, mental and emotional well-being, the cultivation of individual talents and ability through equal opportunity, the development of social and economic literacy and of moral values, improvement of skills in the realm of human relations, the achievement of an understanding of the workings of practical democracy, and an awareness of and loyalty to the ideals of democracy at the child's level of ability to understand them.

The objectives listed above are not controversial ones, and teachers of both "traditionalist" and "modernist" persuasions doubtless would accept them--although there might be disagreement as to how to attain them Our task in elementary education, with respect to goals, therefore, is related to how they best can be achieved.

How successfully goals for elementary children are pursued depends to a large extent on the individual teacher in his daily life with children. Therefore, it is important for him to acquire a body of intellectually examined, educational values as a foundation for his leadership activities in the classroom. This quality of mind, this power of professional judgment, is what gives meaning to classroom activities and, indeed, to the teacher's personal life as well.

Phrased in another way, sound educational values, and the worthy objectives toward which they direct us, reside neither in things nor in phrases but in people. In this sense, "good" goals for elementary education are found within the teacher, and their attainment depends on his skill in organizing learning experiences for children.

In summary, during a span of sixty years our objectives in guiding the progress of children toward maturity have shifted from a narrow concept of formal instruction stressing the three R's to an era in which the schools attempted to assume greatly increased responsibility for total human development.

In some instances, efforts to shape the school's programs so as to improve the total lives of children and to remake community life were overly ambitious, and as a result we now find educational leaders reaffirming more explicitly elementary education's obligation to cultivate intellectual ability as a major ingredient in the experiences of children in school.

Our success in the future, with respect to objectives, depends on a consummate display of professional skill on the part of individual teachers in blending their quest for increase excellence in academic performance with educational experience that is equally effective in influencing the social behavior and emotional maturation of children in desirable ways.

In the process of continuing change in elementary education, let us hope that individual human development continues to be deemed of prime importance and that the nature and quality of our programs motivate boys and girls to continue their education throughout their lives.

ELEMENTARY EDUCATION CURRICULUM*

Curriculum

What should children study? The answer to this question will give us one definition of the curriculum. Children should study reading, writing, and arithmetic--and social studies and science, music and art, health and physical education, and such other subjects as we may think important.

What should children learn? Our answer here may be another way of defining the curriculum. Children should learn whatever they need to make increasing sense out of their world--the languages of printed symbols and of number, for example; the key concepts and generalizations of social studies and science.

They should learn whatever can contribute to their finding deeper satisfaction in their experience--skills of every sort, expressive and mainpulative, intellectual and relational.

They should learn whatever promises to add new dimensions of significance to their lives--what men live by and for, as shown in the interpretations of meanings vying before us now and as revealed in the many kinds of records from the past, including the literature of all the arts.

How should children learn what we think they need to know from whatever we decide they should study? This question proposes still another way of defining the curriculum. Children should certainly be supplied, we will agree, with those conditions that we feel will best forward their search for sense, satisfaction, and significance through all the pertinent subject matters. And it may be that now it is on these conditions that we most need to focus.

Today, our efforts to improve children's learning obviously tend most often to center on proposals to alter or restructure the conditions for learning. What, then, are the conditions we would favor as likely to provide the best setting for children's learning, the best framework for purposes to be pursued and content selected?

Enduring Relationships as the Base

The first, most of us would think, is the presence in the child's life at school of enduring relationships between and among one group of children and a single teacher. The members of a group and their relationships are resources for all kinds of valued learnings: about what is and is not; about other people, all kinds of people; about who one is and what one may become; about giving and getting; about caring and not caring; and about what counts for most.

When they are together over any length of time, children create a culture of their own, out of which goals emerge for personal as well as group growth. And a teacher needs to be with children long enough to learn who each child is--what he feels about himself and others and the world beyond. The teacher needs to have enough time with the same children every day to make good use of the hundred opportunities that may arise to support the testing out of new insights in all the many areas of valued learning. With time enough, what has been learned can be discovered by the teacher and what comes next, charted. With time enough, whatever should be learned can be taught.

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*Reprint of Frazier, Alexander, "Elementary Education Curriculum," NEA Journal, LI (September, 1962), pp. 44-45.

Many Opportunities To Find Out

The good elementary program will certainly include many opportunities every day for children to learn by thinking things through for themselves.

Encompassing the interests and concerns they bring with them and building directly upon those created together, children are helped to tackle the unfamiliar with zest. Though it begin in puzzlement, each new venture should end in wonder and delight.

The successfully learning child, as most of us see him, is impelled by the human need to know. The vital thing for him to find out is that he can learn, that he can find out for himself, and that each new encounter with his world--vigorously pursued--will yield new sense, satisfaction, and significance to take with him into the next encounter.

Children express their need to know through countless questions. Each of their questions tells us where we have been and also where we may wish to go. But we have questions for children too: How can we find out? What else may we need to know? How can we be sure?

Opportunities to find out are created, then, by a fusion of the child's concerns and the teacher's purposes. Thinking things through strengthens the child as a learner and gives him ever new occasions to test his enlarging framework for dealing with the world around him.

Continuous Communication in All Its Forms

In a good program, children have many chances every day to test new ideas through sharing them in all the ways we value. When a child expresses what he feels or values or thinks he is sure of and gets back the responses of those who know him pretty well, he has new data on which to draw. He receives help in imagining new possibilities. He gains a new sense of self.

Striving each time to share something of importance more fully and forcefully, the child returns to specific instruction in the communicative arts with fresh resolve. He searches for ideas that make more sense and for expressions that will be more revealing of the satisfaction he feels with new experiences and with the significance they have for him.

He digs deeper to get at the facts or the essence of the matter. He tries out new ways of sharing the results: a better organized composition on what he learned from the study trip to the wholesale house; a more complex model of the planets to which man will make his first flight; a more elaborate dramatization, with two classmates, of the scene they have selected from Wind in the Willows.

A Great Richness of Resources

All kinds of resources for learning exist, and a great many of them are needed if children are to learn through finding out for themselves.

The search for knowledge requires a broad base for several reasons. Children differ in their ability to gain information and ideas from, let us say, the printed page. By having available materials of several levels of difficulty, more learners will be satisfied in their search.

Children differ, too, in the ease with which they can gain information from various media. Maps and globes may be simpler for one child to read than his geography textbook. A filmed presentation of how tadpoles become frogs may make much more sense to some (but not all) children than the account in the encyclopedia.

Of course, varied resources are needed also because each medium can present some information the others cannot. The globe does something that maps do not. Both are subject to study in ways inappropriate to the printed page. Time-lapse photography has its uniqueness, as does the encyclopedia.

Above all, most of us agree, the child who is to become a true seeker after knowledge must learn, from his very earliest day in school, to go to more than one place for answers to his questions. Here he finds part of what he wants to know; elsewhere, something more. He learns, too, that what he finds in one place may not always jibe with what he has found in another.

Thus, only as he uses many materials can the child learn the skills it takes to enable him to find out for himself, to locate what he wants to know wherever it may be, to read the messages of all kinds of media, to compare and evaluate sources, and to combine whatever he gains so that it becomes his very own.

And Always--The Goal of Balance

The conditions we supply in the elementary curriculum to support the learner's search must be kept in balance.

The learner is valued as a person with differences that may, if properly nourished, help him become uniquely useful. At the same time, the common learnings, basic to our society or requisite for further learning, must be assured. The teacher is vigilant in making sure that personal pursuits add up to something and sees to it that common concerns become a base for but not a barrier to learning more than the minimum that everybody has to know.

The teacher watches for ways to be sure that incidents of daily classroom living lead on to the realization of long-range goals. Opportunities for exploring and creating are balanced with time to take stock and perhaps to review what we need to be sure we know. Checking continuously the experiences of his pupils against what is needed to move ahead in all the areas of valued learning, the teacher finds many ways to extend their learnings.

Balance, then, as seen by most of us, is something to be sought in the total experience of the learner and the group rather than something assumed to be written into the daily schedule. But balance there must be, we are all agreed.

Some conditions are better than others to support the child's search for sense, satisfaction, and significance. Most of us would contend for these as basic: enduring relationships between and among one group of children and a single teacher, many opportunities to learn by thinking things through, many occasions every day to develop power in expressing and testing new learnings, a great variety and supply of resources, and continuous concern for all the aspects and areas of valued learning.

These things most of us would want for sure. And each of us would doubtless ask for more.

INDUSTRIAL ARTS FOR ELEMENTARY SCHOOLS*

The Meaning and Purposes of Industrial Arts

What we mean by industrial arts. Few of the materials which we use are used just as nature produces them. We change the form of the trees of the forest into lumber, then into furniture, parts of buildings, and other products of wood. We change wheat and corn by milling and cooking processes into foods more palatable and wholesome than these grains are as produced by nature. We take the crude iron ore as it comes from the mines and through various changes make it into final forms serving uses so numerous that we sometimes speak of this as the iron age. We change masses of native clays into jars, jugs, vases, and china, both useful and beautiful. We take numerous fibers produced by nature, and through many changes in their form we furnish ourselves with garments suited to every purpose of climate or occasion. All of these changes which we make in the forms of materials, that they may be more useful, we call industrial changes. We speak collectively of the occupations devoted to the making of these changes as industries, or industrial arts. The general term manufactures means about the same thing, but industrial arts is preferable as it is more inclusive.

Industrial arts as distinguished from agriculture, mining, and transportation. Agriculture and mining are occupations devoted to the production of raw materials. Hunting and fishing are also occupations concerned with the securing of certain animal materials used by man. These occupations provide us with the natural materials themselves but they make no changes in their form. The industrial arts have to do with the desirable changes made in the forms of these materials after they are procured. Changing the location of materials and products from place to place by transportation is not a matter of industrial arts but of industrial exchange and commercial geography. We often speak of these changes in location and ownership collectively as transportation and trade. To fix some reasonable limit in our use of the term, industrial arts, we include those occupations only which have to do with the changes in the form of materials, and exclude those occupations having to do with procuring raw materials and transporting them and their products.

Industrial arts as distinguished from fine arts. Man seems to have a universal tendency to beautify all of the materials which he transforms for his use. He also develops a strong tendency to make things purely for the sake of their beauty, quite apart from any use other than that of decoration or of the feeling of satisfaction which they give. He makes products in form

*Reprint of Bonser, Frederick G., and Mossman, Lois C., Industrial Arts for Elementary Schools. New York: The Macmillan Company, 1923. Chapters 1, 2, and 3, pp. 3-51.

and color which express conceptions and feelings of beauty, such as paintings, sculptures, and other ornamental or decorative forms. The activities by which these forms of beauty are expressed and produced are called *fine arts.*

Since the desire for beauty in all that we possess or produce is so fundamental, it is readily seen that the industrial arts and the fine arts are closely and vitally related. Any attempt to separate them completely is artificial. For the sake of emphasis, we may say that the industrial arts are concerned with the *use* of material products, the fine arts with their *beauty*. In the process of their design and production, however, the two purposes are almost inseparably and apart from the industrial arts in such forms as painting and sculpture, their largest field lies in the refining and beautifying of the material products which we fashion to meet the useful purposes of everyday life. In the study of the industrial arts it is therefore very essential to include all of those phases of the fine arts which have to do with beautifying the products of industry. In all problems of design, decoration, and use of industrial products, the fine arts element is included as an integral part of their appropriate development.

Definition of industrial arts. The foregoing paragraphs may now be summarized by defining the industrial arts in this way: *The industrial arts are those occupations by which changes are made in the forms of materials to increase their values for human usage.* As a subject for educative purposes, *industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes.*

The purposes of studying the industrial arts. There are two kinds of study of the industrial arts, each having its own distinctive purpose, the vocational and the general educative purposes.

The vocational purpose. The processes of an industry may be studied for the sake of developing skill and efficiency in producing in this particular industry. This kind of study we call *vocational*. When we use the term *industrial education,* we mean a definite, intensive training for productive work in some industry, as that of the pattern maker, or machinist, or carpenter, or tailor, or plumber, or potter, or tinner, or printer, or automobile mechanic, or factory worker. Industrial education applies to industrial workers as agricultural education applies to farmers, commercial education to stenographers, bookkeepers, and other commercial employees, medical education to physicians, or legal education to lawyers. The vocational study of an industry includes provision for gaining both a knowledge of its processes and sufficient practice in their execution to develop skillful and efficient production. Its fundamental and controlling purpose is to develop efficient workers. It is highly specialized and intensive. To develop the efficiency required, one may have to devote from three or four to eight hours a day to practice in its processes for several years. Clearly, such work has no place in the elementary school nor in the early years of the junior high school.

The general educational purpose. The materials, processes, conditions of production, and the purchase and use of the products of the more important industries may be studied for the values which such study affords in one's everyday life, regardless of his occupation. Such a study of the industrial arts we describe as general. To realize its purposes we make no attempt to develop any considerable degree of skill in any of the several industries studied. Productive skill is not included in its purposes as it is in vocational education. The field includes numerous industries, not limiting itself to one industry as in vocational education.

The purposes or outcomes of the general study are realized in the degree in which it helps one to become efficient in the selection, care, and use of the products of industry, and to become intelligent and humane in the regulation or control of industrial production. This study is from the point of view of the problems, opportunities, and obligations of the consumer and the citizen. It concerns itself with such common, daily needs of life as the selection and use of food, clothing, utensils, household furnishings, and other products of industry; and to such problems of citizenship as call upon us to share in the regulation of industry, so that all employees, employers, and citizens may receive just and fair treatment.

Specific values and objectives in industrial arts. There are five different, though closely related, kinds of value to be derived from the study of the industrial arts which help very fundamentally to guide us in the selection of problems and materials for study. There are also a number of other objectives to be emphasized here and there, but these are realized largely as incidental by-products in the achievement of the five purposes here indicated as dominant. These five objectives may be stated as (1) a health purpose; (2) an economic purpose; (3) an art or aesthetic purpose; (4), a social purpose; and (5) a recreational purpose. A brief description of each follows.

I. The health purpose. In selecting and using foods, our health is the factor of most importance. If we do not get the proper amount and proportion of sugars or starches, proteins, fats, minerals, and vitamines, we are not properly nourished. An inappropriate diet is one of the most common causes of poor health. Our study of the food industries in relationship to health should help us very materially to keep well.

Clothing also affects health. Poorly fitting shoes alone cause much suffering and ill health. Exposure through wearing clothing insufficient for bodily protection, and reduced resistance through wearing clothing that is too warm are frequent causes of susceptibility to disease. A knowledge of the appropriateness of different fabrics and garments for various conditions of season and occasion, from the standpoint of health, should be one important result from the study of clothing.

Problems of heating, lighting, ventilation, and the disposal of waste are health questions related to the study of housing or shelter as a part of industry. Cleanliness in matters of food, clothing, utensils, household furnishings, and tools is a vital health problem. Many of the units in industrial arts provide us with the information that makes for wholesome intelligence and attitudes in caring for health, giving reason and reënforcement for the formation of health habits.

2. The economic purpose. Every purchase we make brings up a problem of both the quality of the material and the proper money value of the article secured. How are we to know what foods to select which will give us just the kinds and amounts needed at a cost that is within our means? How are we to know whether a given textile fabric or garment is of good material, well made, and worth the amount asked for it? How are we to know the real values of pieces of household furniture, of utensils, of table wares, and of other products of industry? The proper study of the industrial arts gives us the basis of judging for ourselves the economic values of products. We learn of the materials entering into these products and of the processes by which they are made with special reference to their values in serving their purposes. If we knew the kinds of cotton and woolen mixtures, cotton and silk mixtures, and cotton and linen mixtures, respectively, entering into certain kinds of fabrics, and how these mixtures differ in durability and permanence of surface appearance, and if we knew how to test and recognize these mixtures as well as pure fabrics, we would be more able to select and purchase fabrics and garments with real economy than if we knew nothing of the content of textiles. If we knew the actual nutritive values of many of the inexpensive foods and how these may be properly cooked or prepared for use, we could substitute some of these for more expensive foods and live quite as well from the standpoint of health at a relatively small cost and without much sacrifice of taste.

3. The art or aesthetic purpose. It is desirable that we be surrounded with things that are beautiful rather than with things that are ugly. With the proper training, one may choose his clothing, household furnishings, utensils, and other industrial products with much satisfaction in their arts elements. One of the large purposes of the study of industrial arts is to cultivate aesthetic taste and discrimination. There are high standards of arts as applied to materials which have been established through the work of many generations by those whose taste has been most refined and most highly cultivated. It is possible for every one to learn the more simple principles that have been developed and to increase his own liking for products which show the best applications of these principles. Of course, people do differ in their capacity to appreciate fine design. Few have a high order of capacity for creative work in design. But all have some capacity for appreciation, and this can be so cultivated as to make possible a considerable degree of satisfaction and success in judging of qualities of beauty in products.

For our people as a whole, the large art problems are those of selecting, purchasing, and using clothing, furnishings, utensils, and other material supplies of various kinds. There is a problem in selecting these from the art standpoint often quite as large as from the economic standpoint. Even health considerations are sometimes sacrificed to art interests. This is notably true with reference to clothing and particularly to shoes. The selection of many industrial products often includes consideration of the three factors, health, economy, and beauty. With a well-developed art sense, selections may usually be made which are in good taste, not in conflict with the laws of health, and not at a cost that is beyond one's means. In every field there are products of excellent taste that are not highly expensive. To be able to select and have that which is beautiful and in good taste without spending money in excess of one's income is a need very real among many of our people and one which we should make every reasonable effort to meet.

The study of the industries with constant attention to the element of design in each individual product, and in compositions in costume, household furnishings, and other combinations of harmonious and pleasing effect is the most promising method of cultivating taste in the selection of industrial products. With children, the study of the principles of design will have little practical effect if they are not studied in direct relationship to the objects of everyday life to which they apply.

4. The social purpose. With the modern development of machinery, power, and the factory system with its specialization of work, many conditions have arisen which easily lead to injustice to employees, employers, or consumers. In some industries, the proprietors have found child labor profitable to themselves. Children so employed often have their health undermined, they are deprived of an education, and they come to adulthood unfitted for the full opportunities and duties of citizenship. They tend to become a public charge, or even a menace, because of their ignorance and their unwholesome attitudes of mind. Some industrial employers have maintained continuous production, keeping their employees at work for seven days in the week. Some have kept men at work for twelve or more hours a day. The unsanitary conditions in many working places have been a menace to the health of their workers. Employers have at times put out work into homes where garments and other articles have been made by persons who had contagious diseases, or where very young children were made to do work for which they were entirely unfit. Workers have formed themselves into unions to try to secure reasonable conditions for work, humane treatment, and reasonable wages. Employers have formed associations among themselves. Because of disputes between the employers and the employees, the consumers have often suffered great losses and inconvenience. Corporations have controlled the production, distribution, and prices of numerous industrial commodities, often seemingly at the expense of the consuming public. Advertising of commodities has often been flagrantly untruthful or misleading. Foods have been exposed under conditions which make their use a menace. From problems relatively small and local to those of nation-wide magnitude, there have been conditions which have called for action in control and regulation. The Consumers' League is a voluntary organization by which many individuals may act together to aid in enforcing satisfactory standards of working conditions by refusing to use the products of any employer who will not maintain such standards. Pure food laws, child labor laws, and laws regulating the hours and conditions of labor have been employed to help in maintaining reasonable standards in the production and sale of commodities. In these matters of social control everyone is concerned and responsible. In some kinds of problems each consumer is interested personally because

of conditions which directly affect his own well being. In other kinds of problems each is concerned because of his responsibility as a citizen for the well being of others, although some of these others may seem very remote. But in a democracy we are all personally and collectively responsible for conditions, subject to control which affect any of us. If any one suffers injustice or injury which we could prevent by working together, then we are all and individually responsible for such injustice or injury. By accepting the opportunities of our democracy we also assume the obligation to do all we reasonably can to regulate conditions so that both employer and employee shall be able to live their lives with treatment as fair and humane as that which we desire for ourselves.

To realize this social purpose of the study of the industries, we must have the knowledge of conditions and problems in many specific situations which will make us genuinely aware of their existence and nature. The need is for such an intelligence about industry as we may secure only by following through in considerable detail the step-by-step changes from raw materials to finished products in many important industries. Acquaintance with the problems and achievements of people generates interest in them and sympathy for them. Those whom we find patiently, efficiently working to produce the goods which bring satisfaction and pleasure to us as they meet our needs become our neighbors in spirit and sympathy whether they are near us or remote from us. The social purpose in the study of the industrial workers and their work is realized in the measure that this study helps us to be intelligent and sympathetic in the regulation of the conditions of production so that employers, employees, and consumers shall all receive complete fairness and justice in the production or use of products.

5. The recreational purpose. The materials, processes, and products of industry appeal to our intellectual interests. Our curiosity as to what things are made of, how they are made, and what they are used for leads us to ask many questions. This interest is strong in early life, but if it has little to satisfy it, it will tend to grow less and to be crowded out by other interests. By the study of the industrial arts, however, new problems are continually appearing which stimulate curiosity, challenge inquiry, and reward investigations by the satisfactions of understanding and achievement. These studies in industry not only help to develop and direct this form of curiosity, but they provide growth at the same time in intelligence about the means by which man supplies himself with products to meet his needs. By these studies, the activities of men become increasingly meaningful. Industry has a significance entirely lost to those who know nothing of its processes and detailed achievements. A lifelong interest may be developed in the activities of industry so that one will find satisfaction and pleasure throughout the years in noting the discoveries, inventions, and new uses and applications of science in industrial production. Such an interest as will lead one to read with satisfaction from week to week or month to month the current reviews of science, inventions, and industrial progress in popular or semi-popular magazines is worth while. This kind of reading habit may easily be stimulated and formed in the elementary school period. To develop an

intelligent, permanent interest in the changes and progress of industry is believed to be a worthy purpose in the study of the industrial arts. This purpose may be realized in part as a by-product of the study with reference to other values, and in part by attention to those phases of industry which may have little value in other terms but which do satisfy curiosity relative to materials, processes, or principles used.

Accessory purposes in the study of the industries. The five purposes which have just been described may be regarded as fundamental. There are certain accessory or subordinate purposes, some of which were once regarded as fundamental or primary in the school work with materials. These are such objectives as the development of manual dexterity; coordination of hand and eye; cultivation of a sense of form; developing a love of bodily labor; cultivating patience, persistence, neatness, and accuracy; and developing powers of observation. All of these, however, as far as they may be developed at all in the elementary school, will be developed as by-products of the work as it is properly directed toward the realization of the five foregoing prominent objectives.

Outcomes of the study of industrial arts. While the purposes stated in the foregoing paragraphs indicate the ends for which the work is planned, it will perhaps help to state the expected outcomes in a slightly different form. What effects as a result of the work are expected upon the behavior of one who has studied the industrial arts? The answer may be expressed in this way: One who has properly studied the industries should:

1. Be aware of general health needs, be able to select and use foods and clothing so that they will help to keep him well, and be intelligent about all phases of cleanliness and sanitation in and around the home. This is the health outcome.
2. Be able to buy and use industrial products of good quality in material and construction and well adapted to their purposes, at costs that are reasonable; to care for what is secured so that it will remain serviceable in its fullest possible measure; to repair, or supervise repairing, when it can be done to advantage; and intelligently to substitute inexpensive for expensive products when this is needed. This is the economic outcome.
3. Love that which is beautiful, and be able to select and use products which are beautiful in themselves, which are well adapted to the particular purpose for which they are chosen, and which fit harmoniously the surroundings in which they are placed. This is the art or aesthetic outcome.
4. Be sensitive to the well being of industrial workers, understand the conditions of the industries, and respond intelligently in all ways possible to help in regulating industry so that no one will suffer injustice or injury for the sake of unfair profits for employers, unfair wages for employees, or unfair prices for consumers. This is the social outcome.
5. Have permanent interests in the materials, processes, products, and achievements of industry which express themselves in observation and reading of the changes, discoveries, and inventions of industry as these are

found in operation or described in current magazines or books; or as expressed in avocational construction of products of special appeal; or as satisfied by observing and enjoying products of use and beauty which one may not be able to possess but which are found in the homes of friends, in public buildings, in shops and stores, and in museums. This is the recreational outcome.

6. Be reasonably dextrous in handling materials, tools, machines, and products found in the general environment; be capable of doing or directing the simple kinds of repair work relating to clothing and the household where the specialist is not needed; and have such qualities as accuracy, neatness, and persistence reasonably well developed with reference to their application to the use or upkeep of industrial products. These are the outcomes incidentally developed through the appropriate realization of the primary outcomes.

The purposes of hand work in the industrial arts. In the study of the changes in materials by which they are transformed into finished products, the basis for determining values in the products is often secured best by entering as much as one can into the processes themselves. It is difficult to understand fully what is involved in spinning or weaving, in designing a book cover or a hat, or in making china ware or paper merely by being told, or even by observing the processes. To help carry these processes through by one's own personal participation, to handle the materials, and to see the problems that arise and help to solve them, gives one an understanding and a feeling of intimate acquaintance that can be got in no other way. The primary purpose of the hand work is to help to make meanings clear and to give a reality of personal experience. This makes for permanence of both interest and the possession of values derived as ideas and attitudes or habits. Manual dexterity comes through the hand work largely as an incidental by-product. The work in construction does not call for much skill. If care is used in the grading of constructions, a normal development of dexterity will follow with very little attention to skill as an end in itself.

Another purpose of the hand work, hardly less important lies in the fact that children enjoy manipulative activities. They often will gladly participate in some form of manipulation without a conscious plan as a first step from which they may be gradually led to interests on higher levels of value. The interest in handling clay may be so directed as to lead to the study of the pottery and other clay industries; making simple play houses may be directed into studies of shelter and furnishings; and the interests in simple weaving and sewing may be developed along lines leading to studies in textiles and garment making. Hand work thus often serves as a means of approach to higher forms of industrial studies, as well as a means of carrying such studies forward with greater interest, understanding, and personal appreciation of meanings and values.

In realizing the purposes here set forth, there will be more hand work required than is usually found in schools which emphasize the development of skill and measure results largely in terms of finished products. Here, the emphasis is upon ideas, attitudes, and habits having to do with health, economic values, and social values. It is a means to a higher end. The interests leading toward the study of the higher values are often initiated through hand work. Children have a strong impulse to manipulate materials, and this impulse may be turned to good account in the development of values altogether higher than those of mere manipulation. In the study of industrial arts the hand work should always be rated as subordinate to the brain work, and supplementary to it.

The purpose and place of excursions. Relatively few industrial processes can be carried on in school as they are in industry itself, and relatively few finished products can be brought to the school. To derive the economic, artistic, and social values for which we are striving, the work of the schoolroom has to be extensively supplemented. Frequent excursions very materially help in securing correct ideas of processes, conditions, and products. Whenever there are industries operative in a community, these should be visited when the work in school in the respective industries is under way. The time of the visit will vary with the purpose. It is often well, when a process has been carried through by hand, to follow this with a visit to a plant where the industrial method may be seen and compared with the method used in school. At times it may be more profitable to visit the plant before the work at school is begun. When a design is to be worked out, it is often wise to visit shops to get suggestions of design as they are used in industry, and to stimulate interest and experimentation.

When selection and cost are the problems, shops and stores should be visited showing varieties of products in various grades of materials, in numerous designs, and in prices of considerable range. This brings the problems of economic and art values before the children in the way most nearly like that by which they are confronted as buyers and users of products. Visits to grocery stores and fruit stores, bakeries, and meat shops may often be very helpful in studies relating to health as well as to economy. Conditions of workers may be noted wherever visits are made and facts brought out for emphasis on the side of either excellence or unfitness as the occasions warrant and as discretion permits.

The Scope and Organization of Industrial Arts

The large number of industries. By a rather general classification of the industries, there are over five hundred in the United States. But these may be divided into hundreds more. Specialization has gone so far that there are literally thousands of separate kinds of industrial production existing in our day and generation. If one should analyze the clothing industries into all of their separate divisions, he would find that they include scores of processes so distinct that each is carried on in a separate factory or plant and by workers specially trained for each process. Consider a general list for a moment: The different industries for spinning, weaving, dyeing, and finishing the four staple textile fabrics, cotton, wool, linen, and silk; for making all of the other accessories used in clothing which one may easily recall with a little reflection. And so, also, for every other large, general industrial field--the food industries, the building trades, the clay industries, the metal-working industries, and numerous others--each represents many separate industrial occupations. Even the printing industry, which we often speak of as one field, is made up of about sixty rather distinct occupations.

Necessity for limiting the field of study. The great number and variety of industries make it evident that we cannot study them all. The time at our disposal is not sufficient to permit of the study of any of them that are not of fundamental importance. This book considers the period of the elementary school only. This period is here interpreted as representing school work through the sixth school grade. If we should add to this the three years of the junion high school and the last year of kindergarten work for the general study of the industries, it would make a total of ten years. To give to the study of the industries one period a day through each of these ten years would not provide time enough to study them all in detail. The field must be limited. As we are here considering the work of the elementary school only, it may be well to note its general purpose to see whether it may suggest any basis for limiting and selecting the work of the industrial arts for this period.

The general purpose of the elementary school. The elementary school devotes its efforts to those elements of study which are of common value to all persons without consideration of sex or future occupation. It limits its work to those needs which are common to all in a democratic form of life. This, of course, does not mean that the individual differences of children are not respected, but it does mean that the common elements by which people live efficiently, cooperatively, and harmoniously together are the basic materials emphasized. All must know how to read, write, and use the general processes of number; all need to know the more permanently important facts and meanings of geography, history, literature, and science as these enter into daily life and intercourse. Is there not also a body of experience and knowledge relative to the industrial arts which is of common value to all, regardless of sex or occupation? If so, this should properly make up the content of the industrial arts as a study for the elementary school to that degree in which elementary school children have the capacity for it.

Determining the content of industrial arts for the elementary school. What we all, as consumers and citizens, need to know and to be able to do relative to the industries is to use their products with intelligence and good taste, and to cooperate intelligently and humanely with others in the regulation of industrial production. In the foregoing chapter, these general aims of the study of the industrial arts were briefly described under the five inclusive terms, health values, economic values, art or aesthetic values, social values, and recreational values. The development of skill in industrial production is left to the later period of vocational education for those who desire to prepare as workers in industrial occupations. The question remaining to be answered is, then, What can children achieve in deriving for themselves these five kinds of value by the time they have completed the elementary school? What can children from about six years of age to twelve or thirteen learn and practice in keeping well, in selecting, purchasing, and using products with economy and taste, in participating in cooperative control, and in deriving recreational values from a study of industrial arts? Since we have found these to be the purposes to be realized by the study, the field must be so limited and the material so selected that the work is constantly directed to specific achievements in the realization of these values.

The limits of the field thus indicated suggest that:

1. Those industrial activities only be selected which have the largest common elements in relationship to these purposes. In other words, that field of industry comes first which has the largest relationship to the common needs of life. Those industries having least relationship to the common needs of life would be omitted, judged constantly, as they must be, from the point of view of the consumer and citizen. By this standard, industries devoted to the production of food, clothing, and shelter would stand at the top of the list, those concerned with the making of walking sticks or artificial limbs would be omitted.

2. Within any industry selected because of its importance to life, those parts would be chosen which furnish the greatest help in meeting our common needs. Not all phases of even a single industry may yield values in terms of our purposes sufficient to make it worth while to include them. For example, a study of the materials and processes employed in the clothing industries provides much help in problems of selecting clothing, but developing skill in any of these processes yields little that is measurable by our standards of value.

By considering the problem of selection and organization by means of a review of past attempts, we may find aid in arriving at a more satisfactory basis. The more important plans under which work with materials has been organized for the schools are briefly summarized in the sections following.

Organization upon the basis of manipulative processes. The earlier work in the use of materials in schools under the term manual training made capacity for manipulative activities the basis of organization. For the lower grades, materials were found which could be handled with ease by young children, such as paper, cardboard, raffia, clay, and coarse yarns. It mattered little what the material was so long as it was easily manipulated, and could be made into pleasing shapes. As ability to handle more refractory material grew through the middle and upper grades, wood, textile fabrics, thread for weaving, leather, metals, reeds and splints for basket weaving, and food materials were added. These materials were made into more or less useful articles, although the purpose which a product might serve when made often received little consideration in planning courses. The measure of success was the degree of skill in manipulation developed as shown by the excellence of workmanship in the finished product.

By this organization, selection of materials and processes included no reference whatsoever to the values representing the life purposes served by the information, attitudes, and habits in meeting our needs as consumers and citizens. There was practically no body of thought or feeling developed except that which was inherently incidental to the manipulative activities. From the standpoint of everyday needs, we have almost no basis for judging of the worth of this work. Any material was welcomed which children could handle with some facility, and for which we could devise patterns which would appeal to their interests. Naturally such a subject was an "unprepared" subject; it had little respectability; it had no place as a "regular" subject; and it was not rated as having any credit value--it was not considered as counting for or against a pupil in matters of promotion. Evidently an organization on the basis of manipulative processes is wholly inadequate when measured by standards representing specific life values.

Organization upon the basis of self-expression. Through the kindergarten and fine arts influences, attempts have been made to organize work with materials upon the basis of the expressive impulses of children. All children have some interest in creatively expressing thoughts and feelings through materials resulting in products which may or may not serve any useful purpose. It is enough if the expression results in the growth of control of the materials used to a degree that brings satisfaction in the products as objects of either use or beauty. The creative impulse is growing and it is free from any limitations which might be placed upon it by any prescribed set of models or by subordinating it to the service of utilitarian purposes. From this point of view, materials and processes are chiefly of value as means for expressing the children's ideas of design and decoration.

While it is true that it is very desirable that children should have much opportunity to express their ideas and feelings of form and color in materials, it is at the same time submitted that this alone gives little basis for the consideration of the values relating to our problems of life as consumers of industrial products. It is also very difficult to organize work in a sequence that is adapted to class usage. Children differ individually in their capacity for creative expression more than in any of the other qualities relating to the various aspects of industrial arts studies. By a more inclusive basis of organization, other values may be realized and, at the same time, very wide provision may be made for self-expression. Under a more inclusive plan, no children need be deprived of an opportunity for the development of creative ability unless it be the very few of exceptional talent in this capacity. Those of rare talent should probably have special treatment, when they are found, providing more extended opportunity for the growth of this capacity. Probably, however, not more than one child in five hundred has talent of an order which would justify such special treatment. If there are as many as one in five hundred, this means that there are today in the United States over fifty thousand such children of school age, and this seems to be a number quite large enough to include them all.

Organization upon the basis of the historic sequence of industrial development. An organization of the industries on the basis of the changes through discoveries and inventions from the days of primitive man to the present time has been developed and used in some schools. By this organization, the lower grades consider the most primitive materials and methods of production in the most important permanent fields of industry. The steps forward through the later ancient, the medieval, and the modern periods are studied as we pass upward through the grades. By this organization comparisons are more or less continuously made between present-day methods of production and those of the past. But present-day methods, problems, and values are relatively neglected. The standards we have set up are not considered definitely, although much which contributes to their realization is implied.

The subject matter and processes brought out by this organization do possess very great value in helping us to understand and interpret the meanings of the processes of industry as they are carried on to-day. But these same elements of subject matter may be utilized by another form of organization which does not neglect the values in which this plan is weak. This evolutionary organization was the first to help us to get a perspective of man's slow industrial development and to emphasize the close relationship between the changes in industrial life and the resultant changes and problems in social life.

Organization upon the basis of materials. The five dominant industrial materials are foods, textiles, woods, metals, and clays and other earth materials. An organization on the basis of these five groups of materials, noting the changes in each as it is carried through the processes from raw material to finished product, was experimentally developed in 1910. The simplest processes in the industrial changes of these materials were placed in the lower grades, and the increasingly difficult processes followed in sequence upward through the middle and higher grades. The values emphasized were those of health, economy, and art from the point of view of the consumer.

While this plan emphasized some of the values which we consider of the greatest importance, the organization was somewhat artificial and arbitrary, and its application was found difficult. To consider the industries which have to do with wood as a material brings together for study such differing problems as furniture making, house building, shipbuilding, paper making, tool making, the making of vehicles, cooperage, box making, and some other industries, alike only in that they use wood as a material. Metals have a very wide range of usage. Clays enter into several important industrial fields as far removed from each other as chinaware and sewer pipes. Taking units of work from these various fields representing the respective materials for each of the grades was an artificial plan of organization which gave little sense of unity or continuity. The course seemed to be but a collection of fragments. From the standpoint of the uses of products made by man, it soon became evident that there is no unity in the materials as materials. Some more fundamental basis of classification was needed, and the basis in materials was abandoned as soon as a better plan was developed.

Organization upon the basis of the uses of products. The large uses of material products center very conveniently for classification about the needs of man for six kinds of service, which are, respectively: food; clothing; shelter; utensils; records for transmitting experience; and tools and machines. The subject matter making up such an organization is found largely in answer to the two questions: (1) What are the changes made in materials which increase their values to make them most useful and satisfying in meeting these six respective forms of need? (2) What are the problems relating to these changes which concern us as consumers and citizens?

To the question, How have we supplied ourselves with clothing in a measure sufficient to satisfy all of the needs and interests we have for clothes, an adequate answer requires a breaking up of the problem into its more essential elements. By this means we are enabled to consider it in relationship to all of the five objectives which we have earlier set forth for each of the large fields of industrial study, namely, health, economy, taste, social relationships, and recreational interests. So, also, may we deal with the same question asked of each of the other five fields representing our principal needs for industrial supplies.

In considering the means by which these several kinds of value are to be developed relative to our needs as consumers and citizens, it will be found that we shall be required to call upon some features that are prominent in the work as organized about each of the other bases indicated in foregoing paragraphs. Some values are brought out best through manipulative activities. Hand work in the making of products teaches methods of construction and the relationship of these to the quality of the materials and products, and helps in the understanding or interpreting of methods more complex than those which can be used in schools. In every construction project there is also an opportunity for self-expression in its design and decoration. We shall also have to consider the historic discoveries and inventions of the race in industrial production to secure aid in interpreting many of the more complex methods of the industries of today in which factory or machine production is very prominent; to get some basis for a perspective of the means by which industrial changes have come about; and to see how these changes have affected social life and the lives of industrial workers. The marvels of ingenuity achieved in adapting a relatively small number of materials to a range of purposes so great as those found in the study of the important industries can hardly fail to stimulate an intellectual curiosity that will tend throughout life to find satisfaction in learning of the new adaptations resulting from discoveries and inventions yet to be made.

From the practical side of the organization into a course of study, the basis of usage of products removes the difficulties of a plan based upon the materials themselves. In clothing, there are numerous materials other than textiles, --leather, furs, rubber, and quite a number of accessory materials.

But as clothing, rather than textiles, is the unit, there is no difficulty in considering anything found useful as serving a clothing purpose. In shelter, it is the house and its equipment and furnishings which constitute the unit, and not wood, or stone, or clay, or metal. The house may be a combination of two or more of these materials. Whatever its component materials, the organization is centered upon the purposes and uses of shelter as these are accomplished by various materials adapted to needs, and not upon the materials themselves.

Organization upon the basis of usage is comprehensive. Whatever there is of genuine value in any plan for the industrial arts may be included under the organization upon the basis of usage. That emphasis which is most important in realizing the purposes of the study should be most prominent in determining the organization. It has been stated in various ways on preceding pages that the only justification for the industrial arts work lies in the desirable changes in behavior which it will bring about in one's selection, use, and enjoyment of the products of industry; in one's participation in the securing of just and fair treatment for producers in industry and for consumers of products; and in one's taking an intelligent interest in the processes, products, and workers in industry as changes in these result from the use of new materials and methods. Whatever will contribute largely toward bringing about desirable results in behavior along these lines is to be regarded as worth while. We do not hesitate to take any good features from any organization proposed, even if most of the features of such an organization are fundamentally inadequate or poor. The weaknesses of most of the organizations for the study of the industries has been in their overemphasis of some relatively unimportant phase and their neglect of other phases altogether more important. It is only since about 1910 that there has been any definite attempt in schools to study the industries as they are carried on in the most modern ways. The earlier manual training made no attempt to study industry as it is. One might become quite proficient in the use of hand-working tools in a school, and be able to make quite creditable pieces of furniture without learning anything of the way in which most furniture of the present time is made in factories. None of the values we have pointed as dominant were included directly as aims. The old forms of the work represented a subject without a subject matter other than that of mere hand technique. It was a system of manipulative activities for the development of either skill or self-expression, and it had no body of thought or appreciative content. As the study is here conceived and presented, the industrial arts includes a body of ideas and meanings, and of interpretative and expressive activities, attitudes, and habits. The outcomes of the study are found in the operation of these experiences in the control of one's conduct whenever conduct relates to the use and enjoyment of industrial products, to the regulative problems of industry, or to the interpretation of new methods of production.

Developing an organization for a course of study. In making a course of study on the basis of the six units of usage into which we have divided the field of needs served by industrial products, we have first to consider the content of each unit as a whole. The question which we have to answer for each is, What can we achieve in realizing the values expected of this unit by the end of the elementary school period? In the clothing unit, for example, our first problem is to list the values in very definite, specific terms for the whole elementary school course. Having done this, our problem is then to organize the sequence of the work. Of all of these problems to be taken up to result in information, habits, attitudes, and appreciations, which problems are within the range of capacity and interest of children of the first grade? Of the second grade? And so on, until we have sequentially distributed the work on clothing pedagogically among the six grades. The same procedure applies to each of the other five units--foods, shelter, utensils, records, and tools and machines.

Of course, before a final assignment of work can be made to any given grade, other subjects and interests have to be taken into account. The study of the industries cannot be isolated from the work in most of the other subjects without very serious loss, both to itself and to the other subjects. The unification of experiences in each of the grades which makes for economy in learning and in time and for breadth and intensity of thought and interest, is a very important phase of the work of curriculum making.

Lines cannot be sharply drawn between the grades in the distribution of work. Some problems may be almost equally well adapted to second or third grade, or others to fourth or fifth grade. But suggestions of sequence may be reasonably definite and yet provide for sufficient flexibility to permit of needed variations and adaptations.

The past experience of the children, the present environment, and the current interests of community life and of the larger life of the world, as a whole, should all contribute in determining the immediate forms of approach to the values to be realized in the industrial arts as well as in all other subjects of study.

The Psychology of Industrial Arts

Impulses used in the study of industrial arts. There are at least four forms of impulse to expression or action which find satisfaction in the several phases of the study of industrial arts:

1. The impulse to manipulative activity, resulting in the handling of materials and tools, and, in time, the using of these in constructive and investigative activities.

2. The impulse to investigate, expressing itself in inquiries about constructive methods, kinds and sources of materials, uses of materials and products, the operation and explanation of devices and principles of machines and constructions, and the relationships of practical activities to human purposes.

3. The art or aesthetic impulse, which finds satisfaction in the enjoyment of beauty in form and color as observed in materials and products,

and in creative production by the designing and constructing of new products.

4. The social impulse, leading one to observe what others are doing, to attempt to share with others their activities, and to secure from others their approval and cooperation in furthering one's own activities.

While these impulses are the chief sources of the practical activities spontaneously engaged in by children, they become associated with many complex forms of inquiry and many intellectual and social problems stimulated by human purposes and values. To account for all of the stimulating elements that may enter into any given unit of industrial arts work may require a number of factors other than these four impulsive tendencies. Yet, basically, whatever self-expressed, driving force there is in the study will rest primarily upon the operation of one or more of these impulses.

The development of these impulses. In many forms of activity, two or more of the four impulses are operative at the same time, and the satisfactions coming from them are complex. It would be difficult to indicate the order of the development in time of these different impulses as the child grows. By the age of school life, all have been operative for several years. The manipulative and the investigative impulses are probably most prominent at this period. While all are developing together, the relative part which each plays in bringing about forms of activity changes as age and experience increase. Individual differences are great in the relative potency of the impulses. In some children, the manipulative impulses are stronger than the investigative, in others the reverse is true. In a few, the art impulse is strong. With many children the manipulative impulse may be very strong for several years and then seem gradually to become subordinate to investigative or art interests.

Considering each of these impulses with reference to its general development may be helpful in furnishing a basis for the selection of kinds of industrial arts problems best suited to satisfy the children's needs from year to year, and, at the same time, direct the work toward the most important life values. A brief analysis of such development follows.

1. The manipulative impulse. The first forms of manipulation are aimless and planless. The activities are largely sensory and motor, and the satisfaction is in the activity itself together with its sensory resultants. Merely handling materials and tools, as tearing paper or cutting it with scissors, pounding or driving nails with a hammer, running the sand of the sand table through one's fingers, squeezing or patting clay, and piling up blocks and knocking them over are examples of manipulative activity appearing in children of kindergarten or first-grade ages. Gradually a second and higher form appears when an aim or conscious purpose enters into the activity. Making a wagon or a sled with the wood, nails, and hammer, making a mountain or a roadway of the sand, making a pie or a dog or a disk out of the clay, and cutting a house or a doll out of the paper are examples of this second form of manipulation. There is an aim of something to be made, but no plan as to details. Satisfaction comes from both the activity itself and the achievement in making some kind of product, crude as it may be.

The third form results in constructive activity with a definite aim and plan. Not only is the final product imaged, but the detailed parts and the respective steps in the construction are thought out. The wagon to be made is to have wheels of a certain kind and size, and other parts are to be of specific form and size. The product to be made of clay is definite in shape and dimensions. Here the satisfaction is in the product and the activity. If the product does not somewhat closely approximate the plan, there is little satisfaction with the work. The skill motive emerges because it begins to have value as a means of achieving a desired result.

Further development of the manipulative impulse, as such, lies largely in the increase of skill in the production of clearly projected objects or in the development of skills associated with other purposes requiring manipulative technique. For many, the mental elements which grow from the investigative impulse take a larger hold than the manipulative, so that for such persons the constructive activities themselves become subordinate. They become means to investigation rather than ends in themselves. References to this will be made again in subsequent paragraphs.

2. The investigative impulse. Questions of "What?" and "What for?" lead children very early to make many observations and explorations and to use much bodily activity. Their aims and activities are casual and vague in their early years. Mental activity and bodily activity are often combined. Satisfaction lies in the activities themselves and in the information resulting.

A higher development of this exploratory impulse appears when the element of "How?" enters. When this form develops, more definite forms of activity, both bodily and mental, result through experimentation and trial-and-result methods of answering questions. Manipulation and investigation are often combined. "Making it this way to see how it will work," "Making a roller coaster that you can guide as you do an automobile," "Making an engine out of tin cans," "Making some chocolate drops like those you buy," and "Making some cakes and having a tea party" are examples of investigative problems that require manipulative activities. Examining automobile engines, visiting factories and shops, watching the operations of derricks, street sweepers, fire engines, threshing machines, hay presses, tractors, locomotives, boats, and other mechanical devices, and asking questions about almost every form of device or machine as to "how it works" are characteristic and familiar evidences of this second level of investigative activity. As a source for answering questions, descriptive reading matter may also be used. Satisfaction is derived from the mental activity and the information gained, and also from the bodily activity used in the experimentation and excursions. To find out the purposes and meanings of operations seen gives satisfaction.

Still a higher level of investigation is reached when the question, "Why?" is added to the "What?" "What for?" and "How?" When this interest develops, the manipulative impulses tend to become almost wholly subordinated to purposes of investigation. Such manipulative activities as are engaged in are largely those required in experimentation. Reading now becomes a prominent means of answering questions. Curiosity has become "scientific," The satisfactions are largely in the mental activity involved in the investigations, and in intellectual appreciations--the joy of knowing and of finding out.

3. The art or aesthetic impulse. Children early manifest an impulse to notice brightly colored objects and to collect and handle these; to show preferences for clothes, household furnishings, and other objects which are highly colored; and to draw and color or model forms in imitation of objects of general interest. Satisfaction lies in the sensory activity stimulated by form and color as observed, and in the manipulative activities involved in making drawings and paintings or models.

A higher level is reached when elements of proportion, balance, and relationships of harmony begin to be operative in the preferences for objects observed, in choices of products used, or in the designing of products. Satisfaction is in the responses to the sensory stimulations, and, in addition to these, in the creative activity in the designing of products. In everyday life, the art impulse expresses itself most fully in the effort to be adorned with clothing and provided with other personal properties which bring satisfactions in form and color. It soon becomes difficult to determine to what degree choices are individual, as this impulse is very markedly modified in its forms of expression by the influence of others.

4. The social impulses. The earliest form of the social impulse is expressed largely on the plane of mere gregariousness--the desire to be with others. Gradually the desire grows in one to share with others what they are doing and to have others participate in one's own activities. It is found through experience that others may help one to carry on one's own plans, and that there are definite values in group cooperation. Exchanges of ideas are profitable, and division of work in a problem of common interest results in the achievement of much more in both quantity and variety in a given time than one could accomplish alone.

From experiences in sharing constructive and investigative problems with others, the facts of interdependence are discovered. The division of labor and cooperation of the practical world are observed. From both personal experience and observation, the meaning of interdependence among all may become clear. An appreciation of this fundamental fact of the dependence of each upon all and of all upon each, if stimulated, will readily lead to feelings and meanings of personal responsibility for the conditions of life and the well-being of others about whose work one becomes interested.

The social impulse also finds expression in a desire to adopt the standards of usage of others--to dress and to furnish one's house as others do, and to have such properties as are possessed by those whom one respects and whose approval one wishes. The art impulse and the social impulse sometimes come into conflict, as when one sacrifices his own choices in form and color to standards socially approved, or when he sacrifices social approval to personal choices.

The development of habits from impulses. While these native impulses furnish the drive for the activities described, they probably do very little to give them definite direction or form. Experience and selection determine the habits which grow from the activities. The impulses provide the possibilities, but experience, results, satisfactions, and surrounding influences bring about the selective growth of particular forms of constructive, investigative, aesthetic, and social habits and attitudes. The activities and the products of the environment and the approval of others are the influences which most profoundly affect the selections of children and determine their interests and habits. Encouraging children to investigate, teaching them methods which bring success, and approving their investigative activities and results will bring about a development of this impulse not found in children not so encouraged. In a similar way these other impulses may be developed into effective habits or attitudes by proper influences, or they may be largely inhibited by neglect or discouragement. Nature but furnishes the tendencies to act in these desirable ways and the satisfactions coming from their activity. What they actually become as skills, interests, attitudes, and appreciations is a matter of educational direction.

How industrial arts should utilize these impulses. In a foregoing chapter, the purposes of the study of the industries most emphasized for the elementary school were stated as relating to health, economic, and art values in the selection and use of industrial products; and to social values as related to the effective regulation of production, distribution, and use of products. These values are to be accomplished by utilizing the impulsive tendencies to activity which have been described in preceding paragraphs. For children, the earlier expressions of interest are in the manipulative and investigative forms of activity with almost no relationship to adult standards of worth. But, as intellectual and social interests develop, it becomes increasingly easy to direct the constructive, investigative, and art activities into forms which are large in the values which we desire to cultivate. From interests merely manipulative and investigative, attention may be gradually transferred to questions and problems of health, economy, and art, by the use of constructive and investigative methods of work as means of answering these questions and solving these problems. Manipulation may become a matter of constructive and experimental dexterities and skills for meeting one's practical needs. Investigation may become a habit of openminded inquiry and method in solving practical and intellectual problems. The art interest may become an attitude and method for the selection of properties and objects for contemplation which yield enjoyment because of their beauty. From the social interest, there may be developed an attitude and a method of behavior relative to the well-being of others.

Factors of growth affecting appropriate selection of work. Certain facts of growth, both physical and mental, have bearings upon the selection of problems. Among these the following are important:

Physiological factors. In children of the first three or four years of school life there is a very uneven growth of bodily parts. This, together with the fact that the nervous coordination of muscles has not yet become well developed, causes clumsiness in the use of the limbs. The child should not be blamed for the resulting awkwardness, as he cannot help it. Gradually through these years the trunk, limbs, muscles, and nervous controls become more fully developed and this awkwardness disappears. Observing the way in which children of these respective years handle a base ball will give evidence of this growing control. In the early school years, the muscles are short, low in elasticity, and of small leverage. At the beginning, the large trunk muscles are more fully developed. Systems of coarser and finer muscles have not yet come to support each other perfectly. Strength is not great, but it rapidly increases, nearly doubling as shown by hand grip from six years of age to nine. Because of these conditions, children in the first school years are not capable of very fine, very precise, very swift, very strong, or very long-sustained motor activities. To insist upon work requiring very much of any of these qualities is probably harmful.

As we pass upward through the fourth, fifth, and sixth school grades, there is marked increase in strength, control, and steadiness. Work requiring greater strength, precision, and endurance may be engaged in without undue effort and without danger of injury. During the ninth and tenth years, there is relatively small growth in either height or weight. But usually in the eleventh and twelfth years there is a period of very rapid growth in height. Up to about twelve, this rate of growth is about the same for boys and girls, but at this time girls begin to grow much more rapidly than boys, so that near the end of the twelfth year girls exceed boys in height by almost two inches. Girls frequently grow as much as two and a half inches in height in a single year. The next year growth falls back to a lower rate for girls, but boys begin to grow so rapidly that by fourteen they are taller than the girls. While growth in height is rapid, growth in weight is relatively small. Marked increase in weight usually follows a period of rapid growth in height. During this period of rapid growth in height, there is often an actual loss in motor control. If, during this period, when children seem to be doing their best and results are no better than those of a year or two earlier, or perhaps not even so good as earlier, the children should not be held blameworthy, as their control may be actually less exact than in the preceding year. Nature is making many changes in the body that are of great importance, and care should be used to avoid both injustice and injury by asking for work that does not demand a bodily strain that is too great. This condition is usually temporary, and improvement will appear again after the period of rapid growth in height is passed.

Mental factors. The mental life of children of the first two or three years in school is characterized by a large interest in sensory activity--in sights and sounds, in handling materials and tools, and in relatively coarse constructive activities. Curiosity is very active, leading to much investigative learning through trial-and-result methods. There is a weak power to project ends, and the interest span for an individual purpose or problem is short. There is a strong and growing interest in the practical activities of the adult life of the community. This interest, combined with the impulse to manipulate, leads to the making of miniature vehicles, utensils, houses, roadways, and other products suggested by environment and adult activities.

There is little power, relatively, to analyze situations and objects, and there is therefore little interest in form, structure, substance, or any abstract relationships. The interest is largely in the element of use--What can a thing do, or, What can you do with it? Inhibition is weak, and ideas tend to pass at once into action. Whatever is new or whatever breaks up the common routine is attractive. Holidays, pageants, the circus, parades, picnics, and other occasional events appeal to the imagination and are of great interest. The planning of work must provide for much variation in detail to hold interest for any continued period. The social consciousness is relatively weak, the child not having learned how to play or work well with other children.

In the years of the middle grades, there are many changes in these mental activities and attitudes. The interest span increases; ability to plan grows; inhibition is developed and unchecked, impulsive action grows less; the interest in the practical activities of the community grows into an interest in the means by which results are secured and becomes strong in mechanical devices, machines, and the application of power; and the ability to play and work effectively with a group develops, making possible many cooperative activities and much team work. Patience is developed for mastering such controls or skills as are needed to bring about desired results. Power to analyze and to see relationships has developed, which makes possible studies of much wider range of meaning and extent. Interest develops near the end of the elementary school period in clubs, associations, or other limited cooperative groups.

About the eleventh or twelfth year there develops an interest in heroic characters. Those who have achieved great results by overcoming obstacles are admired, and there is often expressed a desire to emulate them. The heroes of history and fiction make strong appeals. Curiosity tends to become scientific, and this, together with a tendency to become subjective and introspective, gives science, religion, and social relationships a place of much importance if presented in a natural way. There is often a tendency to moodiness. There is a great dread of ridicule and a strong desire for approbation. It is a time of much exploratory interest, and a time when much may be done to broaden interests in human affairs, problems, and values. It is a time when sympathy and wholesome, interested discussion of one's personal problems are desired and appreciated. Occupational guidance becomes important as a personal issue for many children. A consideration of the industrial occupations from the point of view of what they have to offer as a life work appeals seriously to some. Children may well be introduced to the life stories of many heroic discoverers, inventors, and pioneers as a means of stimulating and directing their interests and ambitions.

If the teachers know the physiological and mental characteristics of the children of their classes, it will help them to select the work adapted to the needs of their pupils, and enable them to avoid work for which there is not a state of physical or mental readiness. The foregoing factors, together with a consideration of the impulses described at the beginning of this chapter, should furnish a basis helpful in the selection and organization of the work in industrial arts.

The question of skill and of manual dexterity. Since the purpose of the study of the industries in the elementary school has to do primarily with the problems of the consumer and citizen, productive skill is but a very minor problem. High degrees of skill become important only when the work is taken up with a vocational aim. In the elementary school it is rather a development of general dexterity with a variety of materials and processes than any form of specialized skill that is wanted. It is, of course, desirable that this dexterity should grow from year to year. But, if constructive projects are well chosen from grade to grade in all of the varieties of materials used, this dexterity will grow normally without any special practice for skill, as such. The standard of proficiency in constructive work which should be maintained throughout the grades is that each child should do his best in each piece of work undertaken.

Important elements in motor training. A summary of the points in motor training presented in The Principles of Teaching, by Edward L. Thorndike, brings out well the most important features of the problem. There are two elements involved in getting results, that of form and that of execution. The element of form has to do with getting clear ideas of what is to be done and how it is to be done. In writing the letter "a", one may study the copy and also carefully observe how one in making an "a" holds the pen and makes the movements. This is the form side of the problem. Execution is actually doing what is to be done--in this case, making the "a". Learning to do a thing means getting clear ideas of what is to be done and how it is done, and then trying to do it, comparing results with copies, trying again, and so on. In each trial, selection should be made of whatever tends toward success and elimination of whatever tends toward failure. Self-criticism and directed retrying until all of the right movements are acquired and all others are eliminated is the method by which motor training is achieved.

In teaching children how to carry on the constructive phases of their work, it is helpful to use imitation freely. Showing one how to do a thing is usually much more effective than merely telling him how. Good methods of handling tools and materials should be shown to children, but is must be remembered that they will not all be able at once to conform to these in all particulars. Want of strength and control may make it best for younger children often to use methods of their own until growth makes it possible for them more easily to adopt adult methods. From the very beginning, children should be taught self-criticism--with good copies, and the locating of the particular elements in which they are succeeding and failing.

To avoid fatiguing the children, one should avoid activities which require controls too difficult for children of a given age. Row found that for children of eight years, nine years, and thirteen years, each giving the same period of time to pen writing and blackboard writing respectively, the loss in hand grip, a measure of fatigue, was from twenty-eight to thirty-seven per cent greater for pen writing than for blackboard writing. Probably any activity for children that produces much fatigue in a short interval of time is too difficult for healthful development. It is entirely un-necessary to have any forms of manipulation in elementary school industrial arts work which produce much fatigue when engaged in for a reasonable period of time.

During the period when children "act first and think afterward," much learning by trial-and-result will occur. It is probably worth while to allow children to find out many things by this kind of experimentation when it does not involve the waste of much material or the spoiling of a cooperative piece of work to which a number are contributing. Failure through impulsive action will tend to bring about an attitude favorable to a closer observation of others who succeed, and to the accepting of advice. Gradually the advantages of planning first and acting in accordance with plans will become appreciated. As early as possible, children should be led to see the values of planning or thinking through their constructive and investigative problems before they begin to construct or investigate.

The broader mental aspects of constructive and investigative problems. Problems in construction and investigation may, and should, involve methods of thinking, judging of the value of the thought, judging of forms of procedure, and judging of results. To include these, however, in more than a relatively trivial degree, the activities must include the designing and planning aspects of the work. They must represent the real expression of thought, or a thinking process by which ideas are clarified and enlarged. Questions of What, and How, and Why have to be answered if the work is anything more than dictation responses. Information must be acquired in relationship to the definite problems. The imagination must be used in seeing the procedure as a plan of action to be carried out. If a loom is to be made upon which to weave a rug, the necessary elements required for weaving must be learned and the loom designed to satisfy these requirements. The new processes in the construction must be considered in relationship to their purposes. As the questions are raised and answered, meanings are realized more fully through the actual constructions and the judgments of results than by merely talking and reading about the problems, or even by looking at pictures or models of objects considered. There is something of meaning and significance which attaches to experiences of actual, practical participation which is not realized without it. The realities of experience make for a genuineness and permanence of meaning not realized from the mere getting of information about facts and relationships. To one who has spun a small quantity of thread or yarn, who has woven a small rug, who has constructed a house or a piece of furniture, who has made a piece of pottery, and who has followed through the different illustrative methods of food preservation-- to such a person all of the industrial activities corresponding to these have a fullness and warmth of interest and meaning not possessed by one who has not had these experiences. There is an attitude of familiarity with the fields of production and their products, and a feeling of sympathy and comradeship with those who are occupied in their production. The larger and fuller our experience with a thing or situation, the larger its meaning for us.

Investigation is a means of increasing our information of both facts and their meanings. Values derived are measured by the degree of importance to life of the questions raised and answered. In the study of all of the industrial arts units, in relationship to health, economic, aesthetic, and other values, many questions will be raised which can be answered only by investigations. The more these investigations include some practical activities such as experiments, constructions, and visits, the more effective they will be and the more lasting the results. Of course this does not mean the elimination of books and other printed matter, but it does mean extensively supplementing it, or, more often, supplementing the investigative work by the use of printed matter. Reading will often stimulate certain forms of experimentation and construction, and the practical work done will, in turn, lead to more reading for further direction and for gaining wider interpretations of meanings and applications. In the study of the evolution of printing, there is a place for the making of the stylus and tablet, a scroll, some papyrus and parchment, and some examples of block dyes for block printing; there is also a place for reading about these and about the conditions of life and the peoples among whom these forms of writing or printing were used.

Appreciations resulting from practical activities. In problems of design and selection, elements of beauty make their appeal and offer an opportunity for the cultivation of artistic appreciation. Likings for desirable qualities in form and color may be developed. The participation in designing and making a Greek bowl or vase should lead to a considerable investigation of Greek design in general, and to a comparison of Greek designs with designs characteristically different. Out of the study we may expect some permanent attitude toward the beauty of Greek design. For approaching the study and for making it real and permanent in its influence, we should count upon the practical work of thinking through the design and executing it in the clay as the basis most significant in giving the whole study its personal and vital appeal. Many of the most permanent elements in the teaching of beauty in industrial commodities will probably be those which are experienced as parts of practical problems in design or selection. When from time to time, practical interest in specific elements of beauty is stimulated, supplementary problems may be taken up in the study of related problems in design in its wider applications, thus gradually furnishing the materials out of which the principles of design, as such, are developing.

So, also, may be approached many of the social phases of the study which it is desirable to include. Finding out how some garment we have was made so cheaply may lead to a sweat shop. Finding out about all of the travels of a boll of cotton, of a lump of coal, or of a can of peas or beets may lead to the factory, the coal breaker, or the farm where child labor contributes to the cheapness of price or to the affluence of the employer. In considering the problems and conditions of life of those engaged in the productive occupations and the meanings which these reveal, feelings of human relationships are experienced, and certain attitudes of sympathy may be developed for these and a sense of solicitude for their well-being may be awakened. These feelings and interests open the way to studies in problems and means of social control and furnish the background for much of the content found in good courses in training for citizenship.

These affective or emotional accompaniments of the industrial arts work are of great significance, for they enter fundamentally into establishing attitudes, or mind sets, prepotent for affecting conduct. Practical activities, utilized to their full opportunities, may contribute very largely to the development of permanent intellectual interests, appreciative attitudes toward beauty as a quality of industrial products, and humane social attitudes toward the producers in industry.

The mental stimulation of industrial studies. The problems of investigation in the study of the industries are such as to provide increasing mental activity. They open up and reveal new questions which appeal to imagination and interest. Hardly a problem may be investigated which does not reveal new lines of exploration, reaching into questions of history, geography, and science. It is only when the technical processes of construction are made the aim that the mental phases of the activity tend to diminish through the concentration upon the habits constituting the particular skills. When attention becomes centered upon these processes of habit formation, the tendency is to reduce mental activity as the skill is increased. There is nothing in the form of activity itself to reveal new problems or interests. This phase of the work, of course, has no place in the elementary school in the study of the industries. The problems for the elementary school are those which constantly tend to evoke increasing appeals to interest and imagination, leading on from problem to problem.

Open-mindedness resulting from participation. By the constant practice of investigating, by which questions are answered and new questions are revealed, the interest in exploratory activities is stimulated. The inquiring attitude of mind is developed. Participation in the forms of activity used in making such investigations develops both the habit of participation and the method for making inquiries successfully. The attitude and the use of successful methods of open-minded inquiry may bring such degrees of efficiency and satisfaction as to make the habit of inquiry of lifelong value.

HANDWORK IN THE ELEMENTARY SCHOOL*

Function of Handwork

Changing ideas about handwork. Handwork is not new. In one form or another it has been used in private and public schools for many years. But during those years there have been radical changes in its objectives. It has been approached from many different angles, depending on the educational philosophy of the particular time or of the group that was responsible for its use.

Handwork was at one time advocated for its disciplinary value by manual-training teachers. Inevitably it became gradually discredited by the breaking down of the theory of formal discipline.

Others thought of handwork merely as "busywork." This work was naturally very formal--including such tasks as paper folding, card sewing, bead stringing, paper weaving and paper braiding, straw stringing, stick laying. This interpretation of handwork, too, inevitably became discredited. Modern educational programs are based on fruitful activities, and hence have no room for mere time-killing pursuits.

Certain educators who believed in the recapitulation theory attempted to re-enact the fundamental industrial processes of the race.

Naturally, among these divergent points of view teachers were bewildered and used any type of construction work that their children liked and that would keep them busy, whether or not it made a contribution to teaching method or enriched the children's experiences.

Dr. James E. Russell in 1909 made the following pertinent comment: "Woolly sheep have sported with polar bears under fir trees set in a desert of sand. Bookbinding and block houses, Indian war bonnets and waterwheels, ink wells and Navajo blankets, bent iron jimcracks and raffia baskets, book shelves and dolls' clothes, broom holders and picture frames--all these and a thousand more mixed up in indescribable confusion!" [1]

Much of this confusion in the past was caused by the fact that teachers and administrators failed to recognize the true function of handwork--that it is an integral part of teaching procedure in the elementary school, that it belongs to all subjects and is not just another subject added to the curriculum. They have not seen, moveover, its value as a device for integrating and correlating school subjects, as well as in forming a bond between the school and the home.

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*Reprint of Chapter 1, Newkirk, Louis V. Integrated Handwork for Elementary Schools. Morristown, New Jersey: Silver Burdett Company, Copyright 1940. Used with permission.

It is heartening to see that there has been an awakening on this matter among both teachers and administrators. Handwork is now accepted by most educators as an essential part of the educational activities of modern elementary schools. They recognize that its use is closely intertwined with the normal learning activities of children and, hence, that it cannot be ignored if the best educational results are to be attained. In spite of this fundamental agreement, however, divergent thinking and trial-and-error methods in the use of handwork in schools have not been uncommon. There is still evident a need for careful thinking on the subject and a more diversified knowledge of handwork and its use.

Handwork and industrial arts. It is essential that there be among both administrators and teachers a clear understanding of the distinction between handwork and industrial arts. Otherwise handwork will not be used to the best advantage as a part of teaching procedure.

Bonser and Mossman have clearly defined educative industrial arts as follows: "Industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes."[2]

Industrial arts is thus a curriculum subject, treating a special phase of our social system. It frequently employs certain handwork techniques as part of its teaching procedure. These techniques are not ends in themselves; they are teaching aids used to further learning in the subject industrial arts.

In contrast, we may define handwork as follows: Handwork is the planned modification of construction materials with the hands or hand tools, to express ideas in all subjects adapted to a handwork approach and to provide a wholesome means of creative leisure-time expression.

Thus handwork has a broader application than industrial arts, because industrial arts is a curriculum subject in itself, whereas handwork provides a part of the approach to learning in many subjects. Handwork, moreover, in addition to this primary function of being a valuable teaching procedure, offers opportunities for creative expression and leisure-time activities for craft clubs and home workshops.

Objectives of Handwork

Handwork in the elementary school has three educational objectives:

1. To give the child an objective medium for expressing his ideas.
2. To provide the child with a manipulative form of creative leisure-time expression.
3. To acquaint the child with a variety of construction materials and to develop handiness with common tools.

1. To give the child an objective medium for expressing his ideas. Much of a child's learning in the social studies, science, industrial arts, literature, oral expression, and arithmetic can be experienced through the integrated use of handwork. Such activities as the making of maps, lantern slides, dioramas, tables problems, and charts, and the collecting and mounting of speciments are typical. Lantern slides, for example, may be used to flash the words of a song on the screen, to show pictures of correct and incorrect posture, or to illustrate an original story. Outline maps, picture maps, product maps, and relief maps are effective in illustrating and objectifying learning in the social studies.

Handwork is superior to any other one method of giving children an understanding of the fundamental industrial processes taught in industrial arts courses. The fundamental processes in printing, bookbinding, making of paper, milling of grains, spinning of yarn, weaving of cloth, making of pottery, tanning of leather, and canning of food can be better understood by children if carried out by them through the use of handwork.

The carrying out of these socially significant industrial processes and the discussion and understanding of their dominance in modern life make a worthy contribution to the education of a child for modern living. A first-hand knowledge of basic industrial processes naturally stimulates reading and observation. It also gives the child an experience that will make a trip to a printing plant or a textile mill more meaningful.

The making of authentic models to promote accurate thinking and observation requires time. Therefore any subject selected for a reproduction should be of real educational importance, and the children should consider the activity well worth doing. An example is the making of a dairy farm on the worktable. This requires reading, observation of photographs, a trip to a dairy farm, an interview with a farmer, and as much information as possible about feeding and caring for the milk cows and about methods of milking and caring for the milk.

It is often advisable, in making an extensive model like a farm, a coal mine, a city water system, or a railroad terminal, to have part of the construction work done at home after the plans have been checked by the teacher. In this way the actual handwork drops into its proper place as one part of a larger educational unit and does not consume more than its fair share of classroom time. Yet, on the other hand, the children are enabled to use their objective medium to the fullest advantage.

2. To provide the child with a manipulative form of creative leisure-time expression. Handwork provides many interesting opportunities for self-expression in leisure hours. Boys like to make model airplanes and kites. Girls like knitting, sewing, and weaving. Both boys and girls like leather tooling, basket weaving, art metalwork and woodworking. Wood carving and soap carving also offer opportunities for interesting creative expression.

Handwork activities designed for leisure time do not always illustrate learning activities in the school. They may be used primarily as hobby activities. The teacher should help pupils to get started on their craft activities through school craft clubs and individual help. But after a boy or girl has learned to tool leather or to knit, the activity should be carried on outside of school hours at home, in the home workshop, or in the club.

Such hobby activities are a by no means insignificant outgrowth of school procedures. Indeed a child who has carried away from his handwork in school an urge to continue some of these techniques for personal pleasure and self-expression has not only learned a very valuable lesson in leisure-time expression. He is fulfilling one of the cherished aims of all education, namely the building of his formal education into his own creative life.

3. To acquaint the child with a variety of construction materials and to develop handiness with common tools. The handwork techniques introduce a child to the proper methods of working with such materials as leather, clay, wood, bamboo, thin metal, wire, cement, paper, cellophane, paint, varnish, enamel, glass, rubber, foods, textiles. He also becomes acquainted with the simple hand tools and learns how to use them. Through knowledge of materials and the use of these simple tools he develops a handiness that can often be utilized to good advantage in his home. Furthermore, a handiness with tools and materials is an important factor in intelligent living.

Handwork and skill. The development of a high degree of craft skill is not the chief purpose of handwork in the elementary school, nor is it of primary importance. A reasonable degree of handiness, however, should develop as children work with tools and materials. This "handyman" skill is developed most successfully when the teacher shows her pupils correct ways of manipulating the simple hand tools.

When pupils are left without instruction or guidance in their use of tools, ineffectual and wasteful habits result. Even though it is not expected that the children will develop great speed or accuracy, they should learn to be neat and careful in their handwork and to produce a product that is in keeping with their ability and maturity. Crude, unsightly handwork, carelessly and thoughtlessly done, has little to recommend it either as self-expression or as objective learning.

Handwork and fine art. Likewise, all types of handwork are improved through the application of art principles. Harmony, balance, proportion, rhythm, and emphasis deserve careful consideration in handwork projects. A child naturally derives the greatest satisfaction from handwork experience when the object he produces is attractive.

Toys should be well designed and pleasingly colored. Baskets should be well proportioned and balanced. Rugs should be woven with a careful choice of harmonious colors and interesting designs. Pottery should be gracefully proportioned and appropriately decorated. The fact that a handwork project is merely part of a larger educational procedure is no excuse for its being inartistic or displeasing.

Types of Handwork

During the discussion of objectives, several types of handwork have been mentioned. An analysis of the construction activities of public and private elementary schools indicates that certain types predominate.

The following list represents those that have been most widely and successfully used in teaching procedures.

- Block Printing
- Blueprinting
- Book and Paper Making
- Child-size Projects
- Clay Modeling
- Cooking
- Dioramas
- Lantern Slides
- Leather Tooling
- Maps and Charts
- Marionettes
- Metalworking
- Models, Apparatus, and Musical Instruments
- Pottery
- Sewing
- Soap Carving and Soap Making
- Table Problems
- Toy Making
- Weaving

A teacher should understand when to use each of these techniques. She must remember, as has been pointed out before, that the handwork of the elementary school is not an end in itself. It only provides one of the means by which pupils may experience learning more completely and may become acquainted with materials and processes in a creative way. Handwork, therefore, should never be used in the classroom to the exclusion of other educational procedures, but rather as a part of them.

Summary: Handwork is so closely intertwined with the other normal learning activities of children that it cannot be ignored if the best educational results are to be realized.

Handwork is the planned modification of construction materials with the hands or hand tools to clarify learning experiences in all subjects adapted to handwork approach and to provide a wholesome means of creative leisure-time expression.

Industrial arts is a single school subject, which frequently uses handwork as a part of its teaching procedure. Handwork is not a subject, but is a teaching procedure which is useful in clarifying many subjects in integrating separate subjects.

Handwork has three objectives: (1) to give the child an objective medium for expressing his ideas; (2) to provide the child with a manipulative form of creative leisure-time expression; and (3) to acquaint the child with a variety of construction materials and to develop handiness with common tools.

Types of handwork useful in the teaching procedures of the elementary school are: block printing, blueprinting, bookmaking and paper making, child-size projects, clay modeling, cooking, dioramas, lantern slides, leather tooling, maps and charts, metalworking, marionettes, models, apparatus, and musical instruments, pottery, sewing, soap carving and soap making, table problems, toy making, and weaving.

A teacher must know how to use handwork techniques, not as ends in themselves, but as a part of other teaching procedures to insure complete learning experiences for the children.

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[1] James E. Russell and Frederick G. Bonser, Industrial Education (Teachers College Bureau of Publications), p. 4

[2] Industrial Arts for Elementary Schools (Macmillan, 1927), p. 5.

INTEGRATION OF HANDWORK*

The activity unit. Handwork is most effectively used when it is presented as a part of the content and procedure of an activity unit. The term activity unit as used in this book designates a large learning situation which provides the child with opportunities for observing, investigating, planning, problem-solving, constructing, evaluating, and correlating; and involves the use of school subjects, such as reading, numbers, science, social studies, and others.

Other terms for these units commonly used in the literature of education are units of interest, centers of interest, and projects. To avoid confusion in the following discussion, we shall use activity unit to apply to the whole learning situation; project, to apply to a specific handwork activity, such as a diorama or a playhouse or a grocery-store building.

Selecting an activity unit. Construction activities cannot be much better than the activity unit in which they are used. If the unit is poorly selected and does not contain vital information, it will contribute little to the pupils' learning experiences. The construction work may prove to be its greatest appeal; but construction alone cannot make valuable learning experiences where learning experiences do not exist. An activity unit should be considered worth while by the children and their teacher and should offer many opportunities for educational development.

The unit must also be well plannned if it is to lead to real educational development. The teacher should have clearly in mind (1) her objectives, (2) the method of organizing and developing the unit, (3) the method of getting it started in the class, (4) possible pupil organization for work, (5) the types of construction activities that are suitable for use, (6) the amount of time that is available, and (7) the desirable outcomes.

The first interest in an activity unit may come from a visit to a farm or to an industrial plant, the telling of a story, the reading of a book, a current event, a vocational experience, a play or a motion picture, an incident on the way to school or on an express train, a ship from the Orient, a radio program from Europe, or any one of a hundred other possibilities.

In the third and fourth grades children often study about China or Japan. The telling of a story, or a picture of a ship from the Orient may lead to an activity unit on one of these countries. With a little encouragement on the part of the teacher an activity unit is almost certain to develop around a country as different from our own as China is. Children are fascinated by the costumes, the foods, and the transportation methods of China.

*Reprinted in part from Chapter 2, Newkirk, Louis V. Integrated Handwork for Elementary Schools. Morristown, New Jersey: Silver Burdett Company, Copyright, 1940. Used with permission.

Conducting the activity unit. The unit may be started by telling stories, reading, and collecting pictures of Chinese life. Possible applications of handwork techniques are the making of a rice field on the sand table, a scrapbook of Chinese pictures, lantern slides of a Chinese house, a Chinese counting frame or abacus, and a puppet show of Chinese characters. Any one of these projects will require reading, planning, manipulation of materials; and will thus add to the value and interest of the activity unit.

The class is not limited to any one handwork technique. Several types are often desirable in developing a unit. For example, some children may decide to make a representation of a rice field on the sand table; another group, Chinese lanterns; an individual pupil, an abacus; another group, some dolls in Chinese costume; and yet another group, some lantern slides showing Chinese writing.

The entire class may benefit from the varied activities of the members through observation and discussion. The completion of the activity unit may well be climaxed by an exhibit of all of the work, during which different members of the class display what they have done and tell about the ideas they have gained in reading and working.

The activity unit may be continued as long as the children are interested and learning is taking place. The Chinese unit can be developed in one week or in six weeks, depending on the reading and manipulative materials available and the length of time open.

The construction work should be completed when the unit is finished and not be extended into another unit. In some communities part of the construction work can be done at home and used as a contact between the school and the homes.

Conducting the handwork in a unit. The pupils are ready to devote a period to construction work when the general introduction to the activity unit has been completed and when they are interested and have made plans for the type of handwork that all have agreed is essential for the proper developing of the activity unit.

The teacher is ready for construction work when the pupils have their plans; the room is organized to facilitate construction work; and the children are responsible for the housekeeping duties. At the end of the construction period the teacher should be free to help the pupils evaluate their experiences. Many short contacts with all the pupils are more effective than long conferences with individuals.

The length and the number of the construction periods will depend on the amount of handwork that is essential to the success of the activity unit. In general, it is good practice to use a double class period, because the arrangement of the room and the cleaning up after work take so much time that one single period will scarcely prove long enough for the successful accomplishment of the work.

The teacher must remember, of course, that the construction work is only one part of the content and experiences of an activity unit. Construction should not be permitted to monopolize the entire instruction time nor to crowd out other desirable approaches. Reading, trips, pictures, motion pictures, and dramatics are all valuable. The wise balancing of all the activities of the unit is one of the teacher's most important tasks.

The classroom is ready for a period of construction work when all papers and books not necessary to the projects have been put away; the workbench placed in a convenient position; the desks or table tops covered with a paper or oilcloth; the paints and brushes placed conveniently on a worktable; and the construction materials and tools necessary assembled in the room and where the children can get them.

Construction work is naturally most effective when well organized and intelligently supervised. This is possible only when the classroom is properly arranged. As has been pointed out, there is no objection to doing construction work in the classroom; in fact, many of the better co-ordinated types of work are done there. But when this work is being carried on, the classroom must be arranged to facilitate construction to the greatest possible extent. To attempt to do such work in a room organized and arranged for reading, writing, and listening is inconvenient for the workers and slows their progress. In addition, it makes the teacher's work of supervision very much more difficult.

Moreover, certain types of construction work cannot well be combined with quiet work in the same period, because they are disturbing to those who wish to read or write while working on their part of the activity unit. It is not a good plan, for example, to have sawing, sandpapering, and pounding going on at times when some of the children are working on problems that require quiet for concentration. It may be possible to have this latter group use the period in library work or other outside research. Otherwise, it is better to move the construction group to the handwork room, or to reorganize the schedule of activities so as to prevent conflict.

The management of the room during periods of construction should be as nearly automatic as possible, so that the teacher will have time to supervise and give suggestions without having to spend her time in waiting on the class. The housekeeping duties should be divided among the pupils, and may be interchanged every week or two. The following duties may be put in charge of pupils: keeping the reference books in order; keeping the tools and workbench in order; taking care of paints and colors; taking care of supplies; cleaning the blackboard; sweeping tables and floor at the end of the work period; and helping to rearrange the classroom.

Sample Activity Units

In order to illustrate the method of integrating handwork in activity units, two sample units are here outlined in considerable detail. These two units, written up by the teachers who conducted them, have been used under practical school conditions with classes of above forty in membership. Both of these units show a pleasing balance in the use of handwork and other activities to give children well-rounded educational experiences.

THE FARM

I. Objectives

To create an interest in and an appreciation of farm life and the work of the farmer.

To extend the child's ideas and interests beyond his immediate environment.

To develop an an understanding of the various steps involved in the journey of food from the farm to the child's table.

To develop an appreciation of the farm as a very important source of food supply.

To give knowledge of the different phases of farm life such as animals, grains, fruits, and vegetables.

To create an enthusiasm for nature.

To show how the use of modern implements and machinery made in the city helps to make the farmer's work more efficient.

To help the child see how the progress of the group as a whole depends on each individual's doing his full part, making his own contribution.

To show our indebtedness to the farmer for the comforts of city life.

II. Introduction of the unit

An interest in the study of farm life was aroused one day when John's collie dog followed him to school. The children became very much excited when the dog entered the classroom. It was the first week of school after summer vacation, and one girl who had just come back from the country remarked that her uncle had a dog on his farm just like John's. She told us about the good times she had had playing with the dog while on the farm and about how the dog helped her uncle.

The other children seemed eager to tell about their good times on a farm too, and so were given an opportunity to relate their experiences to the group. Some had lived on farms. Others had visited farms and told us about their experiences. They told what they had liked to do most of all while they were there. Some had helped to milk the cows, rake the hay, feed the chickens, and do other tasks. They described the activities in which they had participated or had seen others participate.

Some of the children wanted to dramatize activities on the farm. One child was chosen to act out something he had helped to do or had seen done on a farm. The class guessed what he was doing. The one who guessed correctly had the next turn at dramatizing. The children also enjoyed drawing pictures to illustrate their experiences.

During this preliminary discussion many farm buildings, fruits, vegetables, grains, and dairy products had been mentioned, as well as people and animals on the farm. This gathering together of individual experiences helped to build up a general interest concerning the farm.

III. Development of the unit

A. Use of pictures

The teacher had mounted and hung about the room attractive colored pictures that illustrated farm activities such as planting, cultivating, harvesting, feeding and general care of animals, and also pictures of farm buildings, fruits, vegetables, and farm animals. These pictures were used as a means of arousing further interest in the subject and of presenting questions to pupils and stimulating their curiosity. As some of the pictures brought to the minds of the children experiences they had forgotten, more discussion followed.

The children were encouraged to collect pictures to use in their farm booklets and to show to the class. One child brought a picture of a barn and, when telling about it, remarked that he knew how to make one out of a cardboard box. Another child said that he could make some animals out of clay. The conversation continued along this line until it was finally decided to construct a miniature farm on a sand table.

B. Making of a plan for the farm

In talking about the plan for the farm, such questions as the following were asked: "What are some of the things that you will want to show on your plan?" "How would you show the house, barn, and silo?" "What will you use for a path?" The children thought of all the things necessary for their farm and proceeded to draw their plans on Manila paper.

When the plans were finished, they were hung up and discussed. The class had intended to follow the plan they like best. But as there was some objection to almost every plan the children had made, it was decided to work out a general plan on the blackboard.

After each building had been discussed by the class, the child who had drawn the best plan on paper was chosen to place the buildings on the blackboard plan as the children desired. In drawing the plan, a line was used to represent a path, squares for the house and barn, a triangle for the windmill, a circle for the silo, and fields and pasture were filled in with chalk. Suggestions were made for representing other things needed in the plan. After the plan had been made, the teacher wrote on the board at the children's dictation some of the things needed for their farm, such as cows, horses, wagons, orchards, fences, haystack, and mailbox.

C. Organization of material

The next step was to get the material well organized so that actual work could begin. The children were asked to name the animals they would need for the farm. Cows, pigs, horses, sheep, ducks, chickens, turkeys, and a dog were mentioned. The teacher wrote these on the board.

In the same manner lists were made of "Buildings Needed" and "Things to Plant." Under the first, house, barn, garage, silo, chicken coop, windmill, sheepshed, and pigpen were listed; and corn, wheat, lettuce, radishes, turnips, onions, potatoes, cherries, apples, and peaches were put under the heading "Things to Plant."

D. Plans for construction

Real soil was used so that seeds could be planted. The house, garage, and barn were made from cardboard boxes by cutting holes for windows and attaching corrugated paper for the roofs. They were then painted and decorated. Red construction paper was used from the silo. Wagons were made of cardboard boxes with milk-bottle caps for wheels. A low sheepshed was made of cardboard, and the chicken coop was made by pasting two pieces of stiff cardboard together much like a slanting roof. Fences consisted of clay posts connected by wire. Roads were represented by gray cardboard. Grass seed was planted on the lawn, and wheat and corn in the fields. Twigs and sponges were used for trees, and excelsior for the haystack. A frieze painted by two children furnished the background.

E. Formation of committees

Several children expressed a desire to work on special buildings; so it was decided to have committees. As the children volunteered for different committees, the teacher wrote their names on a chart opposite the name of the committee they wished to work on.

One committee took charge of building the house, barn, and silo; another made the other farm buildings; a third committee had charge of the vegetable garden and orchard; a fourth centered its endeavor upon the laying out of fields, constructing fences, and making a road; a fifth committee prepared the pasture and pond; and a sixth group made the animals and people out of clay.

Each committee was held responsible for good work, and every few days reported to the class what had been accomplished. The teacher supervised and gave suggestions when needed.

F. Further discussion

During the making of the barn, silo, sheepshed, and other buildings, the teacher reviewed with the children the uses of each. It was pointed out that the shelters for animals must be clean as well as warm and comfortable, and the precautions taken to keep the cows clean and healthy were talked about. This led to a discussion of animals and their uses on the farm. The children searched through library and supplementary books for information. Different children contributed to the discussion such sentences as

The horses plow the ground and pull heavy loads.
The sheep give us wool for warm clothes.
The dog watches the sheep.
The chickens lay eggs.
The cows give us milk and cream.
Butter is made from the cream.

Short compositions about farm animals were written by different groups of children.

Before the children planted grain on their farm, they had to find out something about different grains. They hunted for information in books, and then a discussion of grains was taken up by the class. Emphasis was placed on wheat. The teacher told the story of wheat from the time it is planted until it is made into a loaf of bread. After this story the children were questioned and asked to contribute sentences to make up a story for their farm books. The teacher wrote on the board as they gave the sentences. The children copied the story for their farm books.

Fruits and vegetables grown on the farm were discussed, and a picture chart was made with pictures the children had cut out of magazines.

During the discussions of farm buildings, animals, and food grown on the farm, the work of the farmer, his wife, and his helpers was brought up and discussed.

G. Other activities connected with the unit

Besides the activities already mentioned, the children engaged in the following activities connected with the study of farm life.

1. Making silhouette slides of farm animals
2. Making butter
3. Making a collection of grains raised on a farm and things made from these grains
4. Planting bean seeds in window boxes and watching them grow
5. Keeping a weather chart

IV. Correlation with other subjects

A. Reading: Riddles, yes-and-no questions for seat work, signs, plans for the day, directions for work, easy books about farm life furnished good experiences.

B. Oral language: The discussions and committee reports offered excellent opportunities for the improvement of speech.

C. Spelling and writing: Children learned to spell and write such words as silo, cow, pasture, farmer, and so on.

D. Science: The unit furnished many experiences. The children learned to recognize farm animals from their pictures and stories. They watched wheat, corn, and grass grow.

E. Number work: Experiences were had in measuring materials for construction, comparing sizes, counting materials and supplies.

F. Music: Appropriate songs were learned such as

"The Farmer," Hollis Dann Music Course, First Year Music (American Book).

"Corn Soldiers," Ibid.
"The Seed Baby," Ibid.
"Baa, Baa, Black Sheep," Songs of Childhood (Ginn).
"Cock-a-Doodle-Do," Ibid.
"Ducks' Song," Ibid.

G. Literature: The Unit provided opportunities for hearing good poems and stories. The children were especially fond of "The Cow," by Robert Louis Stevenson.

V. Desirable outcomes

A. Knowledge

Through reading, pictures, discussions, and construction work the children acquired a fund of information.

1. An idea of the various steps necessary before food completes the journey from the farm to the home
2. Some knowledge of the care and use of animals on the farm, the grains grown on the farm, and the fruits and vegetables raised
3. Several new words used in connection with the activity to be added to the child's vocabulary
4. Some knowledge of the source of milk and how it is kept clean

B. Habits, skills, and attitudes

1. Sharpened powers of observation
2. Growing ability in gathering and organizing information
3. Habits of orderliness and cleanliness with materials
4. Ability to work harmoniously with others
5. Growing ability to express ideas intelligently
6. Greater skill in reading, art, writing, music, the use of numbers, and the handling of construction tools and materials
7. Care for one's own property and respect for the property of others
8. Dependability, self-control, and willingness to co-operate

C. Appreciations

1. Deeper appreciation of the services of the farmer and the other workers on the farm
2. Kinder and more sympathetic attitude toward helpful plants and friendly animals
3. Sense of greater responsibility in caring for plants and animals
4. Growing appreciation of the labor involved, not only in the actual growing of food, but also in its transportation from the farm to the city
5. Increased interest in growing things, which might develop into a recreational interest later
6. More intelligent interpretation of life today

VI. Selected books

Balch, Annie G., Good Times at Grandpa's. Newson, 1926.
Beaty, John Y., On Our Farm. Saalfield, 1932.
Beaty, John Y., How We Farm. Saalfield, n. d.
Dietz, E. Ethel, Good Times on the Farm. Newson, 1923.
Freeman, Frank H. and Others, Child-Story Reader, Book II. Lyons & Carnahan, 1927.
Hader, Berta and Elmer, The Farmer in the Dell. Macmillan, 1931.
Hardy, Evelyn, At the Farm. Nelson, 1921.
Hardy, Marjorie, Surprise Stories, Wheeler, 1929.
Minor, Ruby, Fun at Sunnyside Farm. Ginn, 1928.
Orton, Helen F., Bobby of Cloverfield Farm. Stokes, 1922.
Pennell, Mary E., Old Friends and New. Ginn, 1932.
Read, Helen S., Grandfather's Farm. Scribner, 1928.
Serl, Emma and Evans, Vivian, Work-a-Day Doings on the Farm. Silver Burdett, 1914.
Smith, E. Boyd, The Country Book. Stokes, 1924.
Smith, E. Boyd, The Farm Book. Houghton Mifflin, 1910.
Tippett, James S., The Singing Farmer. World Book, 1927.
Zirbes, Laura and Keliher, Alice V., The Book of Pets. Keystone View, 1928.
Zirbes, Laura and Wesley, Marian J., Story of Milk. Keystone View, n. d.

COLONIAL LIFE

I. Objective

To gain an understanding of early American life, including the houses, home life, food, clothing, education, religion, and amusements of the early settlers.

II. Organization of the unit

The class was divided into eight groups, each group having from three to eight children working together on the topic assigned to the group. All assignments within the groups were made by the group leader, with the guidance of the teacher.

At the end of the working period each group presented its report to the class. This report included talks--illustrated by maps, charts, and articles made by the class--dioramas, pictures, slides, plays, games, dances, and puppet shows. A program given for another group culminated the unit.

The subject matter was divided among groups as follows.

A. Colonial homes
  1. Historical importance
    a. Affect of manners and customs of the people upon their homes
    b. Homes in New England--plain buildings, colonial or Georgian styles

    - c. Homes in the Middle Colonies--typically Dutch, brick houses built close to the walk, with gable end toward the street; a high steep roof joined to the end of the gable-like steps

- B. Interior of colonial homes
  - 1. Furniture
    - a. Beds--four-posters, trundle, and turn-up types
    - b. Chests--made of oak or cedar, and used for clothing and linens
    - c. Chairs--Windsor and ladder-back types; forms, settees, and stools
    - d. Desks--front opened down and surface used for writing; shelves above and drawers below
    - e. Cupboards--variety of styles used to hold dishes and silverware
    - f. Timepieces--hour glasses and large clocks
    - g. Floor coverings--rag carpets, hooked rugs, and painted canvas
  - 2. Heating
    - a. Large fireplaces in earliest days; pots and kettles hanging in fireplace
    - b. Iron stoves in middle of the room
  - 3. Lighting
    - a. Pine torches--gathered in the fall; burned in the fireplace because of the tar which dripped from them
    - b. Candles--dipped, molded, rolled; made of tallow, bayberry wax, and beeswax; used sparingly--hard to make
    - c. Oil lamps--usually attached to the wall; cotton-rag wick wick hung from nose of lamp; melted fat or whale oil burned.

- C. Foods
  - 1. Kinds
    - a. Animals--raised on farms (cattle, hogs); hunted in the woods (turkeys, rabbits, deer, squirrels)
    - b. Huge fresh-water and salt-water fish
    - c. Vegetables--common ones; few potatoes; corn (from the Indians) used in various ways including cornbread, supawn or mush, hasty puddings, and succotash
    - d. Milk--abundant; butter and cheese made in later colonial period
    - e. Sugar--maple sugar and honey; imported sugar used by wealthy colonists
    - f. Delicacies--spices, tea, and coffee imported
  - 2. Preparation
    - a. Preserving food--salting and smoking meats; drying fruits and vegetables; candying fruits and nuts

- b. Butter and cheese making--in later colonial period; churns of wood and stoneware; much labor and attention involved in making of cheese
- c. Apple butter--made in quantities large enough to last through the winter
- d. Cooking of food
  1. All food cooked in the fireplace, where the pots and kettles hung; vessels of copper, brass, and iron; sizes varied, largest about forty pounds
  2. Boiling the usual way; roasting, meats suspended over fire on a strong string and turned regularly with a clock-jack
  3. Ovens--Dutch oven, bake-kettle, and brick oven most common

3. Serving of food
   - a. Dishes--trenchers and wooden bowls used by poorer people; plates, bottles, cups, and porringers of pewter; glass rarely used until late colonial times
   - b. Forks--few; knives and spoons common
   - c. Saltcellar--important, generally silver; placed in center of table and used to separate important from less important people

D. Clothing
   1. Much of the clothing imported at high prices
   2. Raw materials
      - a. Flax grown on the farms and used to make linen
      - b. Wool sheared from sheep raised on the farm
   3. Home manufacture
      - a. Encouraged by colonists; discouraged by England
      - b. Processes used in making cloth
        1. Making of linen thread
        2. Making of woolen thread
        3. Weaving of cloth on looms
   4. Styles of dress in different colonies

E. Colonial education
   1. Schools in different sections
      - a. New England schools
      - b. Southern schools
      - c. Schools in the middle colonies
   2. Types of schools
      - a. Dame's school
      - b. Master's school
      - c. Grammar school
      - d. College
   3. School buildings and equipment
   4. Subjects

        - a. Reading--the Hornbook, New England Primer, Blue-Back Spelling book, and other books for children
        - b. Writing
        - c. Arithmetic

- F. Colonial children
    - 1. Occupations
        - a. Girls' occupations--homemaking; making samplers; knitting; making quilts; soap making; washing; picking geese
        - b. Boys's occupations--making maple sugar; whittling; feeding the hounds; wood gathering and miscellaneous tasks
    - 2. Home training of children
        - a. Religious
        - b. Manners
        - c. Punishments

- G. Religion
    - 1. Religious groups in the colonies
        - a. Puritans
        - b. Angilican Church members
        - c. Quakers
        - d. Catholics
    - 2. Buildings
        - a. Early meeting houses
        - b. Later meeting houses
        - c. Seating the members
        - d. Lack of comfort
    - 3. Sunday in colonial days
        - a. In the South
        - b. Among the Quakers
        - c. Among the Catholics

- H. Colonial amusements
    - 1. Affect of religious beliefs and of surroundings upon the nature of amusements
    - 2. Amusements for adults
        - a. Sports combining work and play
        - b. Races and matches
        - c. Gambling
        - d. Fairs
        - e. Dancing
        - f. Games, cards, etc.
        - g. Music
        - h. Drama
        - i. Holiday celebrations
    - 3. Amusements for children
        - a. Toys
        - b. Games

III. Suggested activities and projects

A. A table project showing a colonial room; making colonial furniture: a bed of wood strung with rope, chair with woven fiber seat, stool with a seat like that on chair

B. A patchwork quilt--six sides to each patch; patches sewed together; cotton filler

C. Rugs--woven on looms made by the class and threaded with carpet warp; woof strips of cotton cloth sewed together

D. Colonial lamps--made from tin cans and sheet aluminum; designs made on the lanterns by puncturing with a nail; lanterns lighted with candles

E. Fireplace--Dutch-oven type; wooden frame covered with brick veneer

F. Costumes--made for figures included in table project

G. Soap making

H. Candle making--by rolling, dipping, or molding

I. Butter churning--churn made from a small keg with broomstick handle and crossed bars for a plunger; butter churned

J. Hornbook--made of wood with sheet of paper fastened to it and covered with a thin, transparent sheet of horn

K. Games and dances of colonial days--Virginia reel, minuet, Old Dan Tucker, Harvest Home, singing games; taught to a group of the children

L. Sandpaper prints--made as follows: trace drawings on sandpaper, color with one color crayon, preferably red; spread printer's ink on with brayer; place sandpaper drawing on a sheet of white paper, enclose both in two pieces of cardboard, and put through wringer. (Cheaper than linoleum)

IV. Selected books

Bailey, Carolyn S., Boys and Girls of Colonial Days. Flanagan, 1927.
Barker, Dodd-Webb, Our Nation Begins. Row, Peterson, 1932.
Coffman, Ramon, New World Settlements. Owen, 1927.
Funk, Frances E., Playtime Round the World. Whitman, 1928.
Heard, Sarah D. and King, Morrill W., Stories of American Pioneers. Winston, 1929.
Lacey, Ida B., Light Then and Now. Macmillan, 1930.

Leetch, Dorothy L., *Annetje and Her Family.* Lothrop, Lee & Shepard, 1926.

MacElroy, Mary H., *Work and Play in Colonial Days*. Macmillan, 1917.

McGuire, Edna and Phillips, Claude A. *Adventuring in Young America*. Macmillan, 1929.

Pratt, Mara L., *Stories of Colonial Children*. Educational Publishing, 1908.

Pratt, Mara L., *America's Story for America's Children,* Book III. Heath, 1901.

Pumphrey, Margaret, *Pilgrim Stories*. Rand, McNally, 1929.

Stone, Gertrude R. and Fickett, M. Grace, *Everyday Life in the Colonies.* Heath, 1905.

Tillinghast, L. Morton and Colman, Edna M., *Colonial Life in America.* Owen, 1928.

INDUSTRIAL ARTS IN THE ELEMENTARY SCHOOL*

The purpose of industrial arts in the elementary grades is to stimulate, enrich, and extend the lerarning of children. It contributes to the personal development of the child and aids in acquainting him with his environment. Continuing research in the field of child growth and development has to led to increased knowledge and a much better understanding of children and of their process of learning.

Learning takes place more readily and is more permanent when there is a strong desire to learn. New information is more readily acquired if it is related to a child's past experiences. Because so many aspects of industrial arts are familiar to children, it is possible to relate new items of knowledge to those in which children have a natural interest and about which they desire to learn more. Children feel free to express themselves through activities which involve more than paper and books. These greater understandings have gradually shaped classroom procedure or ways of teaching to a renewed emphasis on the effectiveness of first hand experiences for children in acquiring the knowledge and skill necessary for effective living in the home, school, and community.

Aesthetic and Technical Values

The industrial arts has values, both aesthetic and technical, unique in itself, but at the same time these values are utilized to deepen, enrich, and extend the learnings of other areas. In other words, it is both a subject area and a way of teaching. In the elementary school, it is part and parcel of the total program.

It is a subject area when the emphasis on the activities and materials results in children learning how people throughout the world have used the tools and materials of their environment to raise their level of living. As a subject it satisfies children's need for constructive activity, and encourages them to use a variety of media for creative expression. As a method or way of teaching the learnings in industrial arts come from children's natural interests in activity and in manipulative materials and devices as a means for expressing themselves. The activities help children relate in a functional way the information taught in all areas.

Individual Differences

The individual differences of children are recognized and cared for in a well-planned and well-organized industrial arts program. Each child works on his own level and at his own speed. The slow learner in an industrial arts program gains many concepts that would not have been possible had only the technique of textbook learning been used. In the project method approach, slow learners see things done, hear reports and discussions, view films, and actually participate in making objects--activities in which they can often engage successfully. Talented children also find such activities a means to enrich and extend their learning by motivating further reading, by writing reports, by constructing authentic replicas of things studied, or by helping other pupils. In the hands of an effective teacher such activities arouse the children's interests and curiosity and provide them with a down-to-earth approach to almost any problem.

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*Reprint of Kurth, E. L. "Industrial Arts in the Elementary School," The Industrial Arts Teacher, XVIII, No. 2 (November-December, 1958), pp. 8-13.

Industrial arts activities are seldom separate and unrelated to other areas being studied. The social studies may be the source of many worth while and real industrial arts experiences. Reading, listening, spelling, writing, discussing, measuring, and computing are skills involved in many activities. Likewise, construction activities are experiences which motivate many additional learning processes. They involve the use of tools and materials in making authentic objects which illustrate and make real many of the subjects about which children read and study.

In the elementary grades, industrial arts activities are the responsibility of the classroom teacher. Although a few countries have special teachers in separate shops at this grade level, the classroom teacher can effectively carry on such activities and relate them to the on-going total program. The preparation of the elementary classroom teacher becomes the key to the program's success. Through lack of experience, many teachers hesitate to incorporate such work into their programs. Actually, industrial arts techniques are natural and easy. Pre-service courses, in-service extension courses, and assistance from secondary school industrial arts teachers are available to elementary teachers who need assistance.

Suggested Units for Lower Elementary Grades

From the kindergarten through grade three, the emphasis in the learning activities is placed upon the immediate environment of the child. The most common elements of a child's environment are his home, the school, and the neighborhood. As the child progresses in school and matures, the neighborhood for him will include the community with its workers and helpers and some of the community-wide functions and activities in which he and his family are concerned and participate. Topics of interest to the child just beginning school may include pets, toys, after-school activities, members of his family, holiday activities, seasons of the year, and activities in his neighborhood. Later other school workers, items in the school, the library, and activities of other children will interest him.

The Child's Expanding Horizon

These interests will lead the child to a wider knowledge of the community with its workers and helpers. Depending upon the location of the home and the school such topics as the city, the bakery, the farm, the dairy farm, the truck farm, the airports, firemen, policemen, trains, trucks, houses, food, clothing, and other community facilities will become subjects about which children will express themselves.

By the time the child reaches the third grade, how food, shelter, and clothing are obtained; how we travel and communicate with each other; our sources of water, electricity, fuel, and other necessary services; the characteristics of a good community and responsibilities of good citizens will be topics for study and discussion. By this time also, his interests will have widened to include a comparison of how people in different communities and countries live.

In the lower elementary grades, children are satisfied with blocks, boxes, boards, and simply made items. A box may be satisfactory to use as a truck, or two boards nailed crosswise may be an airplane. Blocks may be arranged to serve as the corral; a can fastened to a board makes a reasonable tank car or oil truck.

Older children, however, will require more detail and precision in what they make. The freight car probably will need sliding doors, the covered wagon will need wheels that turn and which will be authentic in detail, and the airplane will of necessity have a prop and tail assembly. The child, thus, may be highly motivated to read, discuss, and secure information needed to construct things to put to immediate use.

Activities involving construction for group needs provide opportunities for cooperative planning and evaluation, sharing of tools and materials, acceptance and discharge of responsibilities, self-direction, and proper care of equipment.

The experiences for beginners in school must allow for their short attention span, short-term and spontaneous interest, incessant physical activity, curiosity, desire to manipulate and handle things, and limited ability for cooperative work. Variable and short time interests running from a day or two to a week or so should be utilized.

Upper Elementary Grades, 4, 5, and 6

The transition from grade three to four is not a sharp break in the child's development, the "whole child" continues to develop gradually in line with his growth pattern.

Individual differences continue to increase and there is much overlapping of growth characteristics during these grades. Developmental tasks continue to be of major importance as children develop more refined skills and make rapid progress in the formation of concepts and a more cohesive set of values. They take on more clear-cut rules as boys and girls. Although all children face the same general tasks, different expectancies exist for boys and girls and for children in different socio-economic groups.

By the time children reach the intermediate grades, boys will begin to show more concern for mechanical things such as model making, science experiments, boys' games and outdoor life activities. Girls will share interest in home life, parties, sewing, girls' games, and other typical activities of girls. Boys are expected to be somewhat rougher and more skillful in sports. Girls may begin to show more eye and hand coordination; their manipulative skill may develop a little more rapidly in detail construction, drawing and weaving.

Intellectual growth for all is marked by active curiosity, wide interests, and collecting varieties of things, increased language abilities, improved reading ability, enriched creative work, and growth in social concepts. Work and play are differentiated; real and fanciful are distinguished; dramatic play and consturction become more realistic in detail than in earlier years.

Experiences Based on the Home

At this upper grade level, a child's horizons and interests are continually expanding. To him the history and development of his home state are usually of interest. Other topics may include life in other parts of our state or other states or life in other lands.

Topics of interest may include the arts and crafts of people in other lands and things other people do for recreation on holidays and other times. A comparison of how people live in high lands, low lands, cold lands, hot lands, wet and dry lands, plains and mountains, and differences in transportation, communication, food, clothing, and shelter have more real meaning at the upper grade level. As children gain in development and maturity, their knowledge and study will include colonial life, pioneer life, the westward movement, the various industries and resources of the states. Children learn that some regions had rich soil or other natural resources that caused people to establish new homes there. They learn that other settlements were started by people who were looking for new homes because of political or religious reasons. The history and development of these are the basis for many interesting stories and study.

Toward the end of this grade level period the topics will include a world-wide scope, which may begin with Europe and European backgrounds of American history. Global geography, the eastern and the western hemispheres, the North and the South poles, food, shelter, and clothing, the books, records, industries, natural resources, and skills of various peoples will have new meaning when children reconstruct some of the authentic furnishing and dramatic plays of people from the world over.

As the topics mentioned are developed, attention is given to such major areas of living as transportation, communications, production of goods, conservation, aesthetic and religious expression. As the children's interests move from home, school, and community to the state, nation, neighboring countries and other lands, children develop increasingly deeper insights into ways in which man through the skills, tools, and hand or machine industry has met his basic needs for food, shelter, clothing, and security.

Other areas of the curriculum are all correlated with such topics to stimulate and enrich the learnings involved. For example, art, literature, and music of other cultures become an important part of the units of work and topics about the regions and countries and cultures that are studied.

A variety of activities and materials can be used to facilitate problem-solving, planning, discussion, and evaluation. Varied group and individual activities, community resources, audio-visual materials, books and other references should be applied to these activities and topics. Successful living in our democratic industrial and mechanical culture calls for groups of people to work together to design, plan, and produce the articles and products considered necessary in every - day living. Understanding and interpreting this basic process, which is common to all industries, whether it be done by hand or automatically, is the industrial arts emphasis which can help children adjust to their evironment.

The initial planning and motivation must, of course, be provided by the teacher. The teacher may also need to guide the children in their recognition of how things they do or learn are related to how people work and live in their home or community. In other words, how industrial and mechanical things they do or use affects them or their parents in home or school needs to be pointed out. Such activities need not be continuous but should be frequent enough to keep children interested and stimulated.

Careful attention needs to be given to selecting and planning a unit or an activity. Real motivation for further learning is more certain to result if pupils participate in the selection of an experience and each step of the planning. Most suggestions will come from the teacher; others will come from the children. In any event, it is important that the element of choice is available for the children. If the opportunity to choose is given children, their feeling of responsibility for the success of the unit is usually increased. In addition, the interest is usually more genuine. Most children are very free in expressing their interests.

Examples of How a Unit May Be Developed

When a rich environment is provided by making use of the resources available in the home, community, and the school, the classroom may be viewed as a laboratory of learning. Changes in instructional materials and resources can usually be made as needs and problems arise. The following is an example which illustrates the manner in which one teacher in a Florida classroom arranged her immediate environment in order to begin a unit on the farm with a group of third grade children.

Many of the children in this class lived on farms in which the principal activity was the growing of citrus crops. Interest in this topic developed from one question, "How are farms in Florida different from those in other states?"

This teacher used a reading table to display several books dealing with work activities on the farm, farm animals, and products raised on the farm. Attractive illustrations in color were cut from magazines showing a farmer cutting wheat, feeding cattle, and working in the fields. These were posted on the bulletin board. Photographs and other reference books showing such farm activities as milking, feeding the chickens, loading hay, packing vegetables and fruit, and other activities were put on display around the room. The construction and activity corner of the room already had some trucks, boxes, farm animals, blocks, and character dolls. Boxes of various sizes, tools, nails, and racks for building materials were also available as were other classroom supplies.

The children gathered other pictures illustrating farm scenes in other states and even in other nations. Children brought stories and looked up pictures and other materials relating to the farm. Farm and field layouts were discussed and drawn; visits were made to a dairy farm, to another farm which grew corn and small grain and to a large citrus grove. The work of various people on the farm was discussed. Several boys who had visited a farm in the West decided they wanted to construct a barn that had a stream running near it and a pasture with both cattle and horses. Other children in the class had visited farms on which hogs and sheep were raised. All the children were interested in the animals that were found on most farms and the food which many animals provided for us. Two of the girls in the class had seen some sheep on a farm during shearing time. Another girl's grandmother brought the spinning wheel to school and talked to the class about how clothes at one time were made by its use. A visit was also arranged to a local citrus processing plant. This visit aroused much interest in the number of people that were employed and the various things these people did, where they lived, and some of the related occupations such as driving trucks, working in filling stations, on railroad section crews, on freight trains, and other jobs.

Language Arts Involved

Many other subject matter areas were involved in this unit on the farm. There were language arts experiences which involved not only the discussion about the unit but story telling of earlier episodes from the unit, making of reports, dramatization, writing letters and outlines, listening to others, and spelling some of the new words that were learned. Number experiences were also involved as there was measuring to do in the construction of some of the objects, there was counting, there was reading of numbers as well as computing and solving problems. Various ways of measuring quantities of things produced on the farm proved to be of much interest. Bushels of grain, boxes of fruit, gallons of milk, quarts, pints, pounds, and ounces all began to take on new meaning for most of the pupils. Even the term acre had meaning, and number of trees per acre had significance.

Besides motivating the children to added learning in many of the areas related to this unit, they also learned something about construction and the use of simple tools. Important also was their recognition of the interdependence of people in different parts of the country for food, machines, clothing, and other things.

In another Florida school, a sixth grade group also used industrial arts activities to enrich their learning. The class was studying about Egypt as part of their social studies work. The example given here is how this teacher planned and developed the unit on Egypt.

A Correlated Unit on Egypt

The story of Egypt, one of the earliest civilizations, may be applied effectively to a correlated unit of work. The teacher must formulate the objectives for the unit to be sure all elements of skill and information are included. A good opening question for a teacher-pupil planning session is, "What would you like to find out about Egypt?" Such problem-posing questions as the following may be used:

What did the people look like?
What did they wear?
What did they eat?
What did they do for a living?
What kind of transportation did they have?

These few questions will furnish the purpose for much reading. The reading, in turn, will bring forth other questions such as:

What is a shadoof? How did they use it? Could I make one?
How did the Nile help to make a calendar?
Why was the Sphinx built?
Do they still have mummies?
How could people live so long without rain?

When such thought-provoking questions as these arise, the needs of the children are being met and learning is assured through these many activities:

Purposeful reading
Reporting to the class
Writing stories
Making a shadoof (wood, leather, and clay)
Making pyramids (clay)
Making a sphinx (clay)
Making a hieroglyphic chart

Learnings from such a teaching unit are many and diversified. Outcomes may include ability to interpret printed matter, an understanding of modern techniques of irrigation as derived from the Egyptian shadoof principle, a better understanding of modern construction methods compared to pyramid building, refinement of language skills through story writing and reporting, better citizenship through cooperative working together, self confidence gained by each child as he works on his own level and at his own rate of speed.

Effective use of the unit method of teaching requires many reference books on many reading levels. This is an individualized learning procedure, and the teacher must be prepared to give individual or group help when needed.

Evaluation is also an important part of the unit method of teaching. Proper evaluation by teacher and pupils facilitates building of character through pride in accomplishment, cooperative group work, care of materials, neatness of work, improvement of work habits, and wholesome attitudes.

Pioneer Life in America

Another popular unit in the intermediate grades is one on pioneer life in America. Determining needs and problems that are most likely to arise in any unit is of almost primary importance in the planning. By determining major problems ahead of time, the teacher can engage in more effective pre-planning, and select related activities and materials for each major problem. The problems that are selected should be meaningful to children. They should be stated in simple language and in much the same form as they are likely to arise in the group planning. Those given in the unit on Egypt are questions taken from the children's actual conversation and questions about the unit. The problems of the unit should be stated as puproses of the children or things the group will probably wish to do. Problems in a unit on pioneer life were stated in this manner:

(1) How did pioneers provide shelter, such as lean-tos, dug-outs, stockades, cabins, or forts?
(2) How did pioneers make furniture?
(3) How were clothing and utensils made?
(4) How did the early pioneers dress?
(5) How were homes lighted and heated?
(6) How did pioneers make candles, soap, brooms, and other necessary articles for use in their homes?
(7) What types of guns, powder horns and knives did they use?

Such a unit on pioneer life should result in many types of experiences for youngsters. They may have experience in interviewing elderly people or grandparents in the community concerning some early pioneer experiences. The third grade, previously mentioned, had the grandmother talk to them about the spinning wheel. From this activity their musical experiences may be hearing instrucments, singing songs or composing songs as well as listening to pioneer music. They may also play some of the early games of the pioneers and do the folk dances which were once enjoyed by those people. Their audio-visual experiences, language arts, and number experiences will be similar to those listed for the other units.

Summary

Elementary teachers who include industrial arts activities in their program plan learning experiences in which children use tools and materials. The many authentic objects constructed promote the growth and understanding of other concepts and processes; these, in turn, contribute to desirable behavior changes in pupils. Such construction work promotes the development of basic learning skills. Group planning, selection of materials, appropriate use of tools, manipulative skills, group evaluations and the planning involved are all learning experiences that can be used in other related activities. The value of such construction includes more than just the finished product. Such construction also contributes to understanding, interpreting, and making adjustments to the industrial and mechanical environment in which people live and make a living. Lasting values will be achieved if construction has involved careful planning, serves significant purposes, is realistic, and stimulates learning in the unit of work.

THE ROLE OF INDUSTRIAL ARTS IN ELEMENTARY EDUCATION*

As a professional group of public school industrial arts teachers and teacher educators alike, we have failed to maintain a defensible position regarding the role of "industrial arts" in elementary education.

Activities have long been regarded as an essential phase of the elementary program. Much has been written by elementary educators lauding the merits of constructional activities in the process of child growth and development. Admittedly, elementary teachers may not possess the knowledge of material and construction processes which are essential to a successful constructional activity program. They often do not have confidence in their ability to use the tools and materials basic to construction. However, these are not the major problems since colleges are offering tool and material instruction to increasing numbers of potential elementary teachers, and elementary administrators are seeking the assistance of industrial arts teachers for in-service and cooperative work with elementary teachers. The major problem is one of philosophy. Are we inadvertently contradicting the philosophy of elementary education by our selfish perpetuation of industrial arts as we know it in the junior high school? Are we failing to point out the role of constructional activities as they add meaning and life to the general education of elementary children and implying instead that industrial arts activities are something separate from an integrated program of elementary education? The following paragraphs are intended to convey a point of view regarding the role of industrial arts in the elementary school.

Industrial arts, as a term which indicates a study of the tools, materials, processes, and products of industry is inadequate in describing the role of "constructional activities" in elementary education. Industrial arts must lose its identity as a subject matter field if it is to make its greatest contribution as a means of implementing the generally accepted goals of the elementary school program. The focus of attention is not to be placed upon the study of tools, materials and processes of industry, but rather should be concerned with bringing increased meaning and understanding to units of instruction through group or individual "constructional activities."

Many units of instruction can be introduced, presented or reinforced through a constructional activity. For example, real meaning for such word symbols as "lever," "assemble," and "bend" can be gained through a direct experience with tools and materials. The level of abstraction can be

*Reprint of Miller, W. R. "The Role of Industrial Arts in Elementary Education," The Industrial Arts Teacher, XXII, No. 1 (September-October, 1962), pp. 20-21.

reduced when studying the principles of arithmetic and science. For example, the concept of distances such as "yard" or "foot" can be made more concrete through a constructional activity; the principles of electricity can be made quite real through appropriate constructional activities that provide the student with direct experiences. In addition to the synthesis and correlation of knowledge contained in the instruction units of social studies, arithmetic, science, language arts and music, such constructional activities contribute to the child's sensory-motor development. Children need many experiences of this type which give opportunities for thinking, planning, creative expression, physical activity, use of tools, and coordination development. Nevertheless, as important as these values occurring from constructional activities may be, they are only incidental to the chief purpose, which is to extend and enrich the meaning of some aspect of an instruction unit under consideration. The excellence of the final product is, likewise, not the major consideration. Primary in importance is the learning which has occurred as a result of the constructional activity. This being true, authenticity, genuineness, and truthfulness in the representations are exceedingly important considerations in conducting constructional activities.

For an activity to yield maximum educational benefit to the learner, the teacher must (1) select it in terms of student capabilities, readiness, and interest as well as its potential value to the unit being studied, (2) see that it is adequately planned, (3) instruct and direct the students through the successful execution of the plan and (4) conduct such summarizing activities as necessary to insure effective learning. The success of an activity depends to a large measure upon the teacher's ability to carry out these four steps. For many years educators have been promoting programs that were rich in activities to improve the elementary curriculum. One of the handicaps in introducing constructional activities has been the lack of trained teachers who are capable of teaching these activities which involve planning, tool processes, material usage and, most of all, correlation at the elementary level.

Is this a role for industrial arts at the elementary level that you can accept?

INTRODUCING ELEMENTARY SCHOOL CHILDREN* TO INDUSTRIAL PROCESSES

It seems as though industrial arts activities in elementary school classrooms need to strike a balance between correlating with classroom work and making a unique contribution. If there is no attempt to correlate with other classroom subjects it is more difficult to justify the time devoted to industrial arts activities. In the other extreme, if the only value is to provide a medium of expression, a unique contribution may be lost. A balance between correlation and the unique contribution seems to be most effective for the general education of children.

Industrial arts activities may provide one unique contribution in portraying industrial processes. Children can learn the chief characteristics of materials used in factories, the processes by which materials are formed and the operation of the tools and machines. Some method is needed to determine the basic industrial processes. The quarterly publication of the United States Department of Commerce, Survey of Current Business, gives statistics that provide this type of information. Tables give the number of workers employed in different jobs, volume of materials produced and other significant data.

These statistics can be grouped to give a comparison of principal industrial processes. The latter can then be labeled to fit into a curriculum pattern. One such study made by Delmar Olson sets up sections for manufacturing, transportation, construction, communications, power and others. This division of industrial processes is particularly successful for correlation with elementary school classroom work. Social studies, science, and language arts use units described by one of the five titles; therefore, the correlation is natural.

The industrial arts activities in the University School on the Northern Illinois University campus are organized according to this pattern. The following illustrations are from the activities conducted during the 1964-65 school year.

A third grade science unit required planting seeds and then transplanting the flowers that grew. The seed flats were constructed by the children using a production and assembly line. Half of the class measured, cut and sanded the parts and the other children nailed them together and lined them with aluminum foil. In about an hour they completed fifteen seed flats. The brief introduction emphasized reading the plans, types of wood used and the value of the factory production method. The next activity, a metal pipe xylophone, for the class, was correlated with music. By using a drill press, a jigsaw, a bandsander and a tubing cutter, each child made a simple xylophone in a short time. The music teacher used the completed instruments in her work with the children.

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*Reprint of Gilbert, Harold G. "Introducing Elementary School Children to Industrial Processes," Developing Human Potential Through Industrial Arts, Addresses and Proceedings of the 27th Annual Convention of the American Industrial Arts Association, Tulsa, 1965, pp. 226-27.

A fifth grade social studies text described shoe manufacturing in the New England states. It talked about the die-cutting machine crunching through the leather. The children were provided leather and scissors to make a change purse. After completing a purse by hand, an arbor press was set up with a steel rule die for cutting a similar purse. The children were amazed at the speed and accuracy of the die cutting operation. A manufacturing unit in a third grade started with the children slip casting, glazing and firing planters. When the latter were complete they used them to hold the plants they had grown from seeds. This activity culminated in time to have a useful Christmas gift.

The first-graders had completed a science unit on wind and air when an activity in glider construction was introduced. This reinforced their learning about air, provided measuring practice, and introduced the appreciation of air transportation.

The fifth-graders became interested in building construction near the school. A field trip was conducted to illustrate the principal parts of building construction. As a follow-up of this trip, the class collected and identified samples of building materials used in the neighborhood.

Graphic communications was the principal activity for a fourth grade class. Their social studies unit called for making maps of Illinois. The children used them to label the principal cities, rivers, manufactured goods, agricultural products, and population. They screen-printed five different color maps so each child had his own maps to label. After the maps and a cover with an original design were completed the children used plastic loops to bind them into a book.

After the booklets on Illinois were complete the classroom teacher requested help to get the children to make a dictionary. She had not been successful in getting them to make and keep their own dictionary. However, they were so interested in being able to work with machines and tools that they promised to work with the dictionary if they were allowed to make it themselves. They jigsawed a cover from cardboard, glued leather hinges in place and used a drill press to make holes for plastic lacing to bind it. Their pride in having made their own dictionary in that manner inspired them to use it for their language arts work.

Another sixth grade class used the train in their study of power. Before operating the model they studied the generation and utilization of electrical power in the diesel engine. One of the boys brought in a small gasoline generator which they hooked to a light bulb. This also led to the study of the operation of a gasoline engine.

In this way the children of the University School used units in manufacturing, transportation, construction, communications and power to correlate with their other classroom work. They covered their work more effectively by correlating the industrial arts activities to make a direct application of the material in the other subjects and the classroom work was more enjoyable for the children and the teachers.

INTRODUCING ELEMENTARY CHILDREN TO INDUSTRIAL PROCESS*

Elementary school education deals with those things which are considered to be the common need of all. It is concerned with those things that tend to unify or integrate people. Some pupils travel faster and go farther, but all are headed toward the same common goal as far as the elementary school is concerned.

Education introduced a humanistic element into the school about 100 years ago for the purpose of aiding the child in adjusting to his social environment. About 60 years ago, a scientific element was introduced to help the child adjust to his physical environment. Paralleling the scientific development, and partly as a direct result of it, has come the most remarkable industrial development the world has ever seen.

Work that was formerly carried on in the home, or conspicuously in a village shop, is now performed behind factory walls. Until a few decades ago, children observed and shared in the work of the family. In many instances they were involved in growing cotton or raising sheep; in cleaning, carding, spinning, weaving, and in making the cloth into garments. Boys and girls today know almost nothing about the production of the clothing they wear or, for that matter, about any product they use. This appalling ignorance of products, occupations, and industries is the concomitant outcome of an education program that does not accurately reflect our culture.

Industry has come to occupy an ever-increasing place of importance in the social, economic, and political aspects of life today. Therefore, there is abundant reason why, in order to help children adjust to the large and tremendously important industrial elements which surround them, an industrial element should be added to the humanistic and scientific element already in the elementary school program.

The term industrial element, as used here, should be understood to include agriculture, mining, construction, transportation, communication, trade, and the services as well as the manufacturing industries. Taken as a whole, these constitute the world's work--the activities at which man spends more than one-third of his waking hours--the means by which he subsists and through which he provides the products and services that humanity uses and enjoys.

I would like to suggest that this industrial element in the elementary school program provide for the development of concepts such as the following: (1) Man is a tool-making and tool-using animal. (2) Man has civilized himself through technology. (3) We live in an industrial-technological culture.

*Reprint of Hackett, Donald F. "Introducing Elementary Children to Industrial Process," Developing Human Potential Through Industrial Arts, Addresses and Proceedings of the 27th Annual Convention of the American Industrial Arts Association, Tulsa, 1965. pp. 228-32.

(4) Technology improves man's standard of living. (5) Technology produces change. (6) Man works to be happy, useful and successful. (7) All work has dignity.

Most of us can accept these concepts and the tenet that children can and should understand them. Some of us might claim that industrial arts does this. However, I do not see the traditional form of elementary school industrial arts as the subject, or activity, that can introduce this industrial element into the elementary grades. I do not see the provisions for creative experiences, activity, muscle development, study of industrial processes, social consciousness, and the like, as meeting this need. I doubt that industrial arts or any other contemporary school subject can independently provide this industrial element. Furthermore, any suggestion that we add another subject to the elementary school program would only make a bad situation worse. Therefore, what I am proposing is more a means or method rather than a subject. There are new subject-matter implications, but they affect the elementary teacher education program more than the elementary school program.

What I hope to identify is a rationale for an industrial element and a means for developing it within the framework of the existing elementary school program. This may seem like an additional burden for the already overburdened elementary teacher, but again, it is more a means or method of attaining the goals of elementary school education than a new body of subject matter. As orientation, let us consider for a moment the group for whom this program is to function.

Most children first encounter a rubber-gloved, masked handler wielding a pair of scissors. They are slapped, wrapped, supped, and burped by other white-robed handlers. In time they are stuck, drilled, transported, clothed, sheltered, protected, entertained, and fed. The consciousness is blended in the stir of humanity as it cleans, cooks, delivers, prepares, beautifies, and builds.

We know that pre-school boys and girls play at being adults. Mama's pots and pan's, father's tools, guns, toy trucks, dolls, doctor's kits--these and other toys help children to emulate a grown-up's world.

When children enter the first grade, they find that school is fun. They paint, draw, letter, count, read, play, tell stories, share things and experiences; they do in school those things that children like to do. They visit the dairy, bakery, fire station, hardware store, and the like. They state that they are going to be firemen today, teachers tomorrow, and truck drivers the day after. They are involved in the many things that adults do and they delight in doing them.

By the time children reach the third or fourth grade, they find that the enjoyable, meaningful school program of the early years has become a regimented, subject-oriented obstacle course. They have unrelated classes in reading, writing, arithmetic, science, social studies, and even their industrial arts is sometimes unrelated. The emphasis is on facts--facts divorced from meaning. The fun of learning about the world they once knew has given way to a frantic effort to acquire high test scores and the further they move through the sequence of grades, the more the problem is compounded.

The specific occupations that boys and girls choose each day while in their early years are relatively unimportant; the significant thing is that they do choose occupations. They choose something tangible that gives meaning to and reason for their activity. They choose something of importance that has been a part of their consciousness since birth--something that continues to be important as they grow older because it is the watershed down which their lives tend to flow. Consequently, occupations (the work one does) and industries (the environment in which one does it) constitute two of the few elements of our culture that affect mankind from the cradle to the grave. Herein lies the key to our problem.

If we could establish the world of work as a structure for education and relate to it the facts, concepts, skills, and values of our culture, I believe that all subjects could become meaningful and vital. Within this framework, the various grade levels would provide integrated units of study dealing with selected industries and occupations: the farm, office, store, and factory; the professional, clerical, skilled, unskilled, sales, and technical workers. The uses of the "three R's" as tools by which these people live, work, and play could thus be meaningfully exploited, even to the extent that drill would become meaningful. Manufactured products and the processes by which they are made would be used to illustrate the applications of facts and principles. Appropriate problem-solving experiences would involve the pupils in the application of facts and principles and in the formation of concepts.

In this setting pupils would be introduced to the knowledge, tools, materials, processes, and people involved in providing their food, clothing, shelter, and other products, and their transportation, communications, and services. Industries and occupations in the community, state, nation, and the world, would become subjects of study and the framework that gives meaning and continuity to all of education. Social studies and science books are beginning to provide this sort of study more and more today.

As an example, let us suppose that a sixth-grade teacher decides to integrate the various subjects he or she teaches into a unit on communications. He would first identify the understandings, values, skills, and attitudes that he wishes to develop in the pupil. Very briefly, they might look like this:

Understandings--The pupil understands how radio and television programs are broadcast; how newspapers are published; how the telephone and telegraph function; how designers communicate with builders; how sound travels; the impact of communications on economic and social progress; the interdependence of workers; the relationships between communications and other industries; social and economic problems created by technology in communications.

Values--The pupil will appreciate the people who provide communications; appreciate the technological development in communications; and believe in the democratic process as a way of life and as a technique for solving problems.

Skills and attitudes--The pupil will work effectively with committees in solving problems; use resource materials and persons to aid in problem solving; communicate the results of his research in an effective manner; use democratic processes.

To institute this unit of study, our hypothetical sixth-grade teacher would guide pupils into raising questions about communications that involve the understanding, values, skills, and attitudes we wish to develop. When the questions had sufficiently structured the class efforts so that the outcomes could be attained, the pupils would then plan the ways in which they would find and report answers to their questions and problems.

Groups of pupils would visit the telephone and telegraph office, the newspaper printing plant, a manufacturer, and a radio and television station. All pupils would use the available textbooks, references, and resource persons. Appropriate teaching aids would be used as the teacher provides instruction.

When a child expressed interest in an occupation he had observed, the teacher would listen and approve. He would encourage and help him to get accurate information about his expressed choice. The teacher would scrupulously avoid reflecting his or her sense of values for the choice. All of this would be done in the interests of providing a subtle form of occupational guidance and to help give reason and meaning to the study. (In later years more determined efforts would be made to help each pupil equate his assets and liabilities with his occupational choice.)

In the classroom, each child would speak and write about his experiences. The history, science, mathematics, technology, geography, sociology, and economics of communications would be explored. To illustrate some of the many principles observed and studied, pupils would plan and prepare demonstrations and artistic displays of objects and information from each industry. Through socio-drama they would perform in various occupational roles. They would plan and construct various devices to help them understand and to illustrate the principles and processes of the communications industries. An industrial arts teacher might serve as a consultant. Some of the devices might be: models of television cameras, microphones, consoles, transmitters, and broadcasting towers; telegraph sounders, blinkers, and telephones. Some of the pupils might print a newspaper or bulletin; others might mass-produce a simple product. The constructional activities would be provided because they help the pupil to understand certain principles and because they offer another medium through which learning may take place. The pupils would use tools and materials just as they use pencils and paper--as means to help them acquire concepts, ideas, facts, knowledge, values, skills, and attitudes that will serve them for a lifetime in this changing world of work.

The unit method of teaching has been used in many elementary schools for years, but few have provided much in the way of a study of occupations and industries. To remedy this situation and to permit the implementation of the program outlined here, some overhauling of the college course in industrial arts for elementary teachers is a necessary first step.

Instruction is needed in the uses of a few common tools and materials. The major need is for involving the prospective teachers in a study of industries and occupations in general and the manufacturing industries and occupations in particular. Such a study should develop understanding of the tools, materials, processes, products, occupations, and problems of industry. As a culminating experience, students should plan an integrated unit of study about some major industry and then perform certain constructional activities that demonstrate their understanding of both the subject matter and the method.

This proposal to orient the school program in the world of work, while neither new nor novel, is based on the hypothesis that the world of work can be used effectively as a framework to unite and direct educational efforts. It stems from a belief that unless the school program accurately reflects work as a part of our culture, it cannot purport to transmit our culture. Without this orientation, boys and girls cannot intelligently select and pursue a program of studies that will permit the development of their maximum potential. Consequently, occupation and industries--the world of work--should be a recognizable influence in the content and structure of the entire school program.

INDUSTRIAL ARTS AND THE ELEMENTARY SCHOOL CURRICULUM*

Most educators, when determining curriculum, are in the same dilemma as are most people when buying a new car. There are so many models available; how is one sure that he will make a wise choice? There is, for instance, the special deluxe model that comes fully equipped with such "Class A" accessories as closed circuit television, teaching machines, and programed textbooks. (This is a real leader in the field--just ask the school that owns one.)

For those who can afford it, there is the high-priced luxury model with its solid mathematic-science chassis and its proud indifference to fads and frills. (This one has great snob appeal.) The sports-car bucket-seaters, we understand, are very popular with the younger set who have no way of knowing that their ability-grouping, stick-shifts and departmentalized wire wheels were quite the rage 30 years ago.

Then, of course, there are the foreign imports from Russia, England, and Switzerland, which are preferred by college professors in the Midwest and naval admirals as being far superior to our domestic models. Or, if one really wants to be noticed in a crowd, he may decide on a rare antique still powered by McGuffey's readers.

We would like to suggest we use essentially the same criteria in evaluating or developing our curriculum that we use in buying a car.

In both instances, there are four major questions that should be carefully studied.

Specific Needs

First, and all important: what specific purposes and needs should this car or curriculum serve? In neither case is there one "best" model that is equally suitable for all situations. Apparently most people accept this fact when buying a car. For nowhere do we read of anyone advocating that we should all drive the same model. Yet we hear people arguing for a single-textbook adoption. If people's transportation needs vary so widely, how much more varied are their educational needs?

We jump on bandwagons; we adopt innovations which are not supported by a scrap of conclusive evidence; we copy wholeheartedly from each other without thinking in specific terms of the pupil population that the curriculum is intended to serve.

*Reprint of Petersen, Dorothy G. "Industrial Arts and the Elementary School Curriculum" The Journal of Industrial Arts Education, XXIV, No. 4 (March-April, 1965), pp. 34-36.

Recently we read an article that pointed out there have been in this country entire communities grow up in recent years of extremely intelligent, unusually well-educated academicians and scholars whose children, generally speaking, possess brilliant minds, wide experiential backgrounds, high levels of cultural sophistication, and strong motivations toward academic learning. These children are eager to learn and are capable of learning. We see nothing wrong in offering them an intellectually-challenging, academically-oriented curriculum. When we are designing this curriculum, however, we must remember that these youngsters are not primarily little scientists or little mathematicians. They are children with the same social, emotional, physical, and aesthetic needs of all children.

Now let us look at a completely different situation. In our large cities, a third of the children in public schools are culturally disadvantaged. Some of these children are Negro, Puerto Rican, and first-generation Americans. All suffer from a low socio-economic background and cultural depriviation. These are the potential dropouts, the possible delinquents, and the future unemployed.

What type of school program will fit their needs? First, these children need teachers who understand them, who like them, and who realize a high degree of satisfaction from working with them. It is sad but true that many teachers are very reluctant to teach in schools in underprivileged areas for several reasons.

Some of them have been frightened by the "blackboard jungle concept." We know from current newpaper and television reports that the problem of discipline in certain types of schools cannot be dismissed lightly. In general, however, this is a problem of greater concern on the secondary level rather than the elementary.

Sociologists tell us that 95 percent of our teachers come from middle-class homes, which makes it difficult for them to understand the lower-class child.

The curriculum for these children shouldn't be the predominantly verbal curriculum of the past that restricted children to the three activities of reading, writing, and listening--activities providing no opportunity for these children to excel.

It should include a wide variety of activities such as observing, drawing, modeling, building, playing, singing, dancing, dramatizing, and others, along with the necessary verbal activities.

It should be implemented with reading materials that have some meaning for these children. The traditionally banal, placid, sterile readers with their stories and illustrations of sparkling clean homes, doting mothers and fathers, exciting family trips on ocean liners, etc., have no relationship to the culturally deprived youngster. How can children be motivated toward reading something which they don't understand, to which they can't relate, or with which they can't identify? Fortunately, there are some books appearing on the market that do attempt to relate to these children.

We have thus far discussed only two extremes of pupil population. As all of us know, most school populations are very heterogeneous and include pupils who range along the continuum from one extreme to the other. It is possible to design a curriculum to meet the needs of this heterogeneous group.

Four essentials are necessary. They include rich, broad *programs* providing for a wide variety of learning activities and experiences, capable *teachers* who recognize and welcome the individual differences existing in any group (classes not larger than 25 pupils that permit the teacher to teach small groups and/or individuals), and a wealth of *learning materials and aids*.

After the specific purposes of curriculum (or a car) have been determined, a second criterion to be applied relates to the important feature of *design and construction*.

Design and Construction

In the case of a car one wants to know if it is solidly built, if road tests guarantee smooth performance, and if the final product has smooth, clean, sure lines.

The same questions apply to a curriculum. Most curriculum designs today may be placed on a continuum between two polar philosophies of education commonly called the subject-centered and the learner-centered approaches. The basic pattern nearest to the subject-centered pole is usually called the separate-subjects curriculum.

It was the most common pattern of the elementary school during the 19th and early 20th centuries, and is still used in some schools, although it may be modified to some extent. In this pattern, each subject is taught as an entity within itself with little or no relationship to other subjects.

The extreme opposite is the learner-centered curriculum that carried a variety of titles, but that we will call the unified curriculum. In this design, major emphasis is put upon a central, learner-centric problem, such as, "Why is electricity important to man?"

A thorough investigation of this problem demands a variety of activities which cross over, and combine, many academic areas.

Most good elementary schools have moved, over the years, from the subject-centered approach to the learner-centered philosophy for many sound reasons. We will examine two of them. The first is practical.

In Colonial days the elementary curriculum consisted of reading and religion. Then arithmetic and, later, geography were added. This additive process accelerated in the late 19th and early 20th centuries as history, science, art, music, industrial arts, homemaking, and many other subjects were introduced.

It is still continuing with foreign languages and listening the most recent additions in some schools. Anyone who has tried to work with this "bulging curriculum" knows that the desperate cry of all elementary teachers is "where am I going to get the time?"

One answer is to increase the length of the school day and school year. But this is only a partial answer. Another has been to reorganize the curriculum into units, whereby subjects are taught in combination or integration with each other rather than attempting to teach more than 20 subjects a day in separate, compartmentalized, little packages.

This is not the only (or even the best) reason for unit teaching. From our knowledge of the learning process, we are convinced that the unit curriculum is the school's way of organizing content that most closely approximates a natural, "real-life" learning experience. It is almost impossible to keep areas separate. The deeper one goes into any one field, the more he will find himself crossing boundaries into other fields.

One of the elements of good design, that we mentioned earlier, was balance. We are well aware of the criticisms directed toward the unit method today by some specialists. Most of these criticisms stem from a fear of neglecting or ignoring certain areas.

Many geographers, for instance, don't like to merge geography with history because they say the result is not really social studies but merely history. Unfortunately, in some cases, these criticisms are justified.

It is important to keep in mind that not all areas must necessarily be integrated within the unit. A unit on electricity may not call for many musical activities. It is better to teach music separately rather than strive for artificial correlations.

Dynamic Content

The third criterion? How many of us would be happy if we bought a new, 1965 car and discovered, after we drove it home, that it was built with 30-year-old, second-hand materials.

About 40 years ago, Rugg wrote, "Not once in a century and a half of national history has the curriculum of the school caught up with the dynamic content of American life."

Twenty years later Miel said the same thing. We simply cannot give children a re-built, 1930 model curriculum and call it by a 1965 name. We must have an up-to-date model made of the best and most modern materials.

Let us enumerate some of the factors of our modern society that demand widesweeping changes in the traditional program. First, there are social forces such as the well-known explosions of population and knowledge. Secondly, there are changes in family structure including teen-age marriages and employed mothers.

There is also increasing evidence of such social and mental ills as delinquency, crime, alcoholism, and marital unhappiness. Other factors are the increasing availability of leisure time, changing moral and spiritual values, and international tensions.

Then there are all the technological developments. More and better instructional aids and newly developed media of communication make the traditional curriculum as out-dated as a Stanley Steamer.

Changing educational ideology and increasing research with emphasis on the nature of learning, the growth of the learner, provision for individual differences, the importance of group dynamics, and others, contribute to the need for a dynamic modern curriculum.

What are a few examples of the new material or content which should be included in a 1965 model curriculum?

There is a strong need for rethinking in the social studies area. The traditional curriculum in which we taught the postman, the dairy farm, and the firehouse may be seriously inadequate for many of today's sophisticated, widely-traveled youngsters.

The "Europe-centered" curriculum of the upper elementary grades is completely out-dated for children who are growing up in a world characterized by the emerging importance of Asiatic, South American, and African nations.

In science, too, there is a greater and different emphasis. The "biological-centered" curriculum of the past has been expanded to include important aspects of the physical and earth sciences. Our technological society demands children be introduced to a study of industrial processes and materials. This is where your field, of course, can make such a great contribution.

The new or modern mathematics program has received so much publicity that we need only mention it here. The same is true with foreign languages.

Competent Workmanship

We have deliberately left the most important criterion until last. Years of driving a car have convinced us there is nothing more important than the workmanship which has put a car together. The materials may be without flaw. The design on the drawing board may be superb. But if incompetent or careless workmen have put the vehicle together, the whole thing is just a second- or third-rate product.

We have been teaching school as long as we have been driving a car and we have come to the same conclusion in this field. The curriculum content may be excellent. The design may be perfect on paper. But if it is all put together by an indifferent or poorly qualified teacher, the result is inferior.

While space does not allow us to discuss in detail the qualities and competencies which characterize effective teaching today in the elementary school, we would like to mention one important point about present-day teaching methods. Bruner distinguishes between two kinds of teaching. One takes place in the expository mode and one takes place in the hypothetical mode.

In the first the role of the child is the listener. His task is to learn according to predetermined order and organization. The content is presented to him by the teacher in the role of expositor.

In the second mode the pupil learns through the important act of discovery, which Bruner defines as "a matter of rearranging or transforming evidence in such a way that one is enabled to go beyond the evidence as reassembled to new insights."

Can industrial arts be taught through this second method? Should it be taught through a "do-this-do-that-watch-me-now-you-do-it" approach? Is this the way great technological advances and discoveries are made? Or have they been made by creative individuals who approached problems from new viewpoints, and who experimented with and manipulated materials to find solutions?

We suspect it has been the latter and we suspect this is the method used today by expert industrial arts teachers.

In closing, we would like to point out to you that the automobile, an invention, which has had an unparalleled influence on American society, was not the invention of a single person. It was, and is, the product of many minds and many hands.

THE ACTIVITY UNIT*

An activity unit is a large learning situation, extending over a considerable period of time, which unifies subject areas as well as pupil experiences and provides the child with opportunities for observing, investigating, planning, problem-solving, constructing, and evaluating.

A Suggested Outline

I. Teacher Objectives: Statement or listing of educational goals--the things the teacher wishes to develop in the children.

II. Introduction or Orientation: Method or methods of motivating pupils toward the unit area. Preparation of pupils (arousing interest) by developing some background.

III. Pupils' Objectives : Pupils' aims not necessarily the same as the teacher's.

IV. Development of the Unit:

A. Planning. Teacher-pupil discussion concerning:
1. Things to be found out
2. What needs to be done to find them out
3. Division of labor according to interests, needs, abilities
4. Appointment of committees
5. Sources of information
6. Sources of materials

B. Activities. Activities will vary with objectives and the unit. Children learn by doing--by experiencing. Some typical activities for the working periods are:
- Tours or trips--fire station, museum, etc.
- Work with visual materials--collect pictures, study movies, examine exhibits, organize notebooks.
- Study of problems--interpret maps, prepare and give reports, consult encyclopedias, perform experiments (make soap, candles, paper), evaluate material
- Motor activities--dioramas, panoramas, puppets; make cookies, jelly; make working models of machines, make model utensils and tools of wood, metal, and papier mache. Draw and construct relief and product maps.
- Appreciation activities--read stories and poems for pleasure, draw and paint pictures.
- Present information--edit and publish newspaper, organize bulletin board, give dramatization, keep growth graphs.

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*Developed by the Department of Industrial Education, Eastern Michigan University, Ypsilanti, Michigan, 1967.

V. Integration of Subject Matter: Identify how the various subject matter fields are integrated in studying this unit. The topic of the unit is central with various subjects being drawn upon at the most teachable moment. Please note the appropriate tools, materials and processes of industry which will help to increase the understanding of our industrial culture.

VI. Correlations: List tentative correlations between activities and subject matter areas--written language, oral language, spelling, science, social studies, arithmetic or numbers work, safety, health, music, literature, etc.

VII. Culminating Activity: Aid in summarizing and evaluating unit. Provides a climax and stimulates realistic pupil objectives. Suggested culminating activities are a classroom open house, an exhibit, a puppet show, pupil dramatization, program, etc.

VIII. Bibliography:
  A. For teacher
  B. For pupils
  C. Audio-visual aids
  D. Other teaching resources

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Distinguishing Characteristics of the Desirable Broad Unit of Work*

1. A broad unit of work should deal with some area of experience or problem of living sufficiently significant to justify careful study.
2. A broad unit of work should be vital, interesting, and challenging to all of the children.
3. A broad unit of work should harmonize with the developmental level of the children and deal with problems and materials within the comprehension of the group.
4. A broad unit of work should provide rich first-hand experiences.
5. A broad unit of work should provide a variety of experiences and activities for the classroom group and for individual children.
6. A broad unit of work should provide for socialization of the children.
7. A broad unit of work should involve wide research that can be done by the children.
8. A broad unit of work should encourage and stimulate the creative abilities of children.
9. A broad unit of work should provide for skills in action and for teacher diagnosis of further skills to be taught.

*Reprinted in part from Burr, James B., Harding, Lowry W., and Jacobs, Leland B. Student Teaching in the Elementary School. 2d ed. revised. New York: Appleton-Century-Crofts, Inc., 1958. pp. 118-120.

Questions Related to the Study of Industry in This Unit

1. Does this acitivity unit help children understand American industry?

2. Are the appropriate tools, materials, and processes of industry identified as part of the unit of study?

3. What occupational study or understandings are inherent in your unit of study? Can you list a number of them?

4. How does this unit assist children in learning about their industrial environment?

5. What industrial knowledge, skills, and attitudes should be developed through these activities? What general knowledge, skills, and attitudes should be learned?

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LEARNING AND THE LEARNER: IMPLICATIONS FOR INDUSTRIAL ARTS*

Even though educators, by virtue of their teaching, are responsible for the learning of pupils, we find it difficult to talk about the way in which learning occurs. So-called theories of learning have not been of much help to the classroom teacher. These theories, in the main, were not intended to explain classroom type learning, and the data which gave rise to the theories did not come from experiments in classrooms but came from laboratory situations. What makes it equally difficult for us to talk about learning is that we do not know if school learning is the same as non-school learning; nor do we know whether problem-solving in tests is the same as problem solving in non-test situations. In like manner, we are hard put to tell whether learning in one curriculum area is similar or different than learning in another curriculum area. For example, when a student learns something in industrial arts, is his mode of learning the same as or different than his mode of learning in the language arts? These difficulties do not deter us, for every teacher goes about the daily professional activity of trying to help his pupils learn. If we find it difficult to describe learning, it suggests that we do not know ways in which teachers can take into account some principles of learning in organizing for instruction. Such is not the case, for there are some principles of learning of which a teacher may be cognizant in facilitating the learning of students in industrial arts activities.

1. A Feeling of Power

It is rather well known that in order for learning to occur, the learner must have a feeling of power. That is to say, each person must feel that he interacts effectively with his environment and is able to master those elements of his environment with which he is confronted fairly frequently. Equally important is that the learner be able to master adequately the greater portion of the problematic situations with which his environment presents him. There is nothing quite so deterring to learning as when a learner has a feeling of powerlessness. To be powerless is to be passive with resultant withdrawal from the learning situation. But with a sense of power, the learner deals actively and effectively with his environment.

We must now ask ourselves the question, "What type of environment is it in which our youngsters live?" It becomes immediately apparent that we in the United States live in an industrial technology, in an environment in which industry and the products of industry play an important part in the economic, social, and political aspects of our lives. Industry and technology are major influences in determining how the people of our society will behave and

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*Reprint of Waetjen, Walter B. "Learning and the Learner: Implications for Industrial Arts," The Journal of Industrial Arts Education. XXIII No. 3 (January-February, 1964), pp. 17-18, 66.

and believe. Therefore, it is necessary that the youngsters in our society learn to deal effectively with that environment. It comes as no surprise that this is why industrial education is in the curriculum of the schools in our country. Not only must our children know their technological environment, but they must be able to use it and to deal with it in a highly adequate way. In the process of so doing, they will learn not only what that industrial technological society is like, but also they will come to have the sense of power which is a requisite to learning.

A person may develop some sense of power as a learner by using materials. By virtue of making the projects which are produced in industrial arts programs, a youngster may come to feel that he is dealing with some of the tools and the materials in his environment in an adequate way. However, in order to develop a broader sense of power, one that will serve to advantage in many situations, it helps when the industrial arts curriculum is organized in such a way that by studying industries pupils become acutely sensitive of the kind of environment in which they live.

When pupils engage in activities where there are no pre-determined answers but may experiment with materials and with outcomes, they are being helped to see that they can indeed master part of their environment. In this connection both teachers and learners may ask themselves three questions about any learning activity. Answers to these questions would bear significantly on the matter of whether learners were feeling power in their ability to control and deal effectively with their world. The questions are as follows: (1) What impact have I had on objects or materials in my environment? (2) What impact have I had on the people in my environment? and (3) What impact have I had on myself?

Industrial arts educators are in a fortunate situation with respect to these questions. In other curriculum areas, history being one, the learner must of necessity talk about the experience of other people for, indeed, that is what history is. It is a chronicle of social events in a chronological context. Students in industrial arts have the great advantage of being able to talk about their own experience. They can discuss the experimentation in which they participated. They can relate the testing of the materials with which they were working, and they can discuss the way in which their group functioned in carrying out some kind of group project. While the point may seem obscure, it must still be made clear that it is easier for a learner to sense power in his ability to learn and to handle his environment effectively when he is reflecting on and talking about his own experience rather than the experience of others. One can learn many facts but still have a rather low sense of power as a learner.

2. Image Building by the Learner

Another principle of learning which may be used to advantage by the industrial arts educator has to do with the image that a student has of himself as a learner. All people have a view of themselves as learners and, what is even more important, is that they behave accordingly with that view. If a person sees himself as one who is inept in certain kinds of learning activities, he will perform ineptly. One of the major findings running through many researches having to do with the underachieving student is that of his low estimation of his own learning ability. The underachieving student is not one who is low in intellectual ability or who is a slow learner; rather, he is a person who is able but relatively unproductive in his achievement. Passow and Goldberg[1] conducted a study of the self-attitudes of achieving and underachieving high-ability students. These high school students had high intellectual ability but some were achieving while others were underachieving. On self-attitudes, it was found there were two categories of items that discriminated between those students. The categories were on the task-related and intellective items on a test that measured self-perceptions. Those specific items that discriminated in favor of the high-achieving student were the following: working independently; carrying out responsibility; self-confidence; solving problems; speaking before groups; expressing their ideas in writing; thinking clearly; eagerness to learn; and judgment.

Not only did the underachieving students rate themselves poorly on the items mentioned above, but they behaved accordingly. This study and others give us assurance that one's self-image as a learner is a powerful determinant as to how a person will learn. The discerning teacher will always ask himself the question, "How does the student acquire this self-image?" Primarily, our self-image as a learner comes about as a result of the way other people behave towards us. We learn from other people what kind of person we are. When others observe our behavior and evaluate it, they tend to reflect or communicate these evaluations or appraisals to us. The way in which they do may be subtle but nonetheless real. The teacher is in a highly crucial position in this regard for he constantly communicates appraisals to pupils.

When students participate in learning tasks or situations in which they have social commerce with fellow students, there is great opportunity for reflection of appraisals to occur. Group projects wherein relatively small groups of students plan, develop, and carry through the completion some kind of project that bears on industry and technology enable each individual to take many different roles in the group and to have other group members reflect to him his progress and effectiveness. Thus it is possible for one to discover and develop his own learning capacity and the capacities of other students.

The teacher can benefit from this principle of learning. A teacher can go through a planned sequence of steps which would enable students to improve their image of self as a learner. Having completed a given instructional activity, the teacher reflects or communicates to individual learners the success which they have achieved. For example, if the teacher has given five different shop-math problems, and a youngster achieves success on two of them, the teacher says, "You had two correct." It should be noted that this is a direct reflection of fact. The teacher should be careful to not say, "You've done an excellent job with these problems," for indeed the learner has not done an excellent job. But it is important that the teacher reflect the fact of the youngster's success without evaluation. The second step is that the teacher goes over with the student those problems or responses which were dealt with correctly. He makes sure that the student has an intellectual insight into what it was that he did that spelled for success.

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[1] Passow, A. Harry and Goldberg, Miriam L., Educational Leadership, "Study of Underachieving Gifted," 12:121-25, November, 1958.

The third step is one that most teachers take first. Now, the teacher corrects the learners' mistakes. In addition, the teacher opens the door to new ways of learning and helps the learner to vary his performance. If the third step be taken first, the teacher runs the risk of saying to the student in effect, "You did not learn well," which is precisely what the teacher does not wish to communicate to the youngster. It matters little whether the teacher in this instance is a teacher of industrial arts, physical education, civics, mathematics, or biology. The procedure is the same, but it is important that the teacher seize on every opportunity where even the most miniscule degree of success has been achieved by a student.

Another principle of learning involves the availability of alternatives in a learning situation. The more alternatives, the better the learning of the student. Industrial arts teachers are slowly moving away from the practice of a lock-step sequence of projects wherein tool skills were emphasized and the completed project was the primary outcome. There can be no doubt that youngsters learned in this kind of situation, but there were precious few alternatives available to them. The intent is not to cast stones at projects or at the idea that a class of youngsters make and identical project, for there are times when this may be desirable. But when this becomes the sole teaching process or procedure, there are too few alternatives available with a resulting lowering of the level of achievement and intellectual insight into the industrial arts. On the other hand, when an industrial arts curriculum emphasizes tool skills, processes of industry, the production of materials, the economics of an industry, and the social problems created by all of these foregoing, then we can say that many more alternatives are available. In this kind of situation a person can select, compare, develop depth in a given area, contrast and perceive relationships. To return to our first principle of learning, he can, therefore, feel a sense of mastery, a sense of power.

3. Motivation by the Learner

A final principle of learning is one implicitly known to almost anyone who has ever tried to teach. The principle is that learning involves wanting to learn. Motivation to learn gives rise to the types of behavior in which a person seeks knowledge by moving toward his environment, by asking questions of other people, by manipulating objects in his environment, and by choosing the new and different over the old and familiar. Over the years teachers have been concerned about and interested in developing greater motivation to learn among their students. As a rule they take the position that all one must do is to present some highly interesting material and that this has enough carry-over to help a student to learn. Not only is such an idea fallacious, but it is also highly misleading.

What increases a student's motivation is his knowing there will always be something to look forward to in the classroom environment. When an individual is in an environment that is well-known to him and is highly similar to previous situations, he rapidly becomes bored. The learner becomes restless, verbal activity increases, anxiety tends to mount, and he becomes increasingly unable to focus his attention and thought on specific ideas. In short, the highly familiar environment appears to be an enemy of motivation and of learning. When the learning situation is vastly different from previous situations, its unfamiliarity causes the student to psychologically back away. He has little on which to predict what his behavior should be in that situation. We, therefore, see that the highly familiar as well as the highly novel environment is one that does not help the student's motivation and, consequently, does not help him to learn. Fortunately, there is median ground.

If a pupil is in an environment that, for the most part, is familiar but in which there is some element of novelty, difference, or variety, his motivation increases. This occurs when the student finds that most of the classroom environment matches his previous experience but there is also some mis-match. The mis-match causes the student to try to discover why the present classroom situation is discordant with his experience. As a result he moves toward the facilities and knowledge available in the laboratory. It becomes immediately apparent to the industrial arts teacher that this is the kind of classroom situation that all teachers hope for. Here the student is not a passive receptor of knowledge; rather, he takes steps toward knowledge. Many teachers refer to this kind of student as being a "curious" person. What is important for us to know is that the high curious student lives in a psychologically larger environment than the low curious student. Because he lives in the psychologically larger environment, he has a possibility for picking up a greater amount and range of information. There is a greater possibility for learning more facts, for learning more tool skills, and for learning more about the structure of industries in our society.

The discerning industrial arts teacher would muse as to how to promote curiosity in students if it is such a desirable trait. The teacher engenders curiosity by providing the kind of laboratory in which students cannot fully predict occurrences. Each pupil has something to "look forward to," as it were. This makes students curious about their environment and enhances their learning. A second suggestion might well be introduced by a question. Who asks the questions in the typical classroom situation? Traditionally, teachers are the ones who ask questions and students answer them. It is a paradox that this be so, since one would presume that students ask questions in order to obtain information. In short, we have reversed roles. Here is the very strong implication that the industrial arts teacher not only encourage but he actually contrive situations whereby students are the ones who ask questions. This may be done by very simple expediencies in a classroom. For example, in industrial arts we frequently give demonstrations as to how to use materials or tools. While demonstrating we impart information. We show a student as well as tell him that he should not plane all the way across the end grain of a board to avoid splitting out the end. Without giving verbal information the teacher might actually demonstrate what happens when the plane does go all the way across the end grain of the board. The teacher might then ask the class why the board split off. The student may then ask questions to seek an explanation for this occurrence but the teacher should be careful to indicate that the questions asked by the students will be answered only "yes" or "no" by the teacher. This technique places the student in the position of seeking knowledge from the teacher rather than the teacher seeking knowledge from the student. At once the student is an active participator and learner.

TEACHER EDUCATION PROGRAMS FOR ELEMENTARY SCHOOL INDUSTRIAL ARTS *

One of the least analyzed teacher education programs in the industrial arts curriculum is that dealing with elementary school industrial arts construction activity.

In the past, industrial arts departments have forfeited this rich instructional area to art department personnel under the colors of "handcrafts" or "crafts." This has occurred in both teacher education and in the field of teaching. A close look at the objectives of these art-centered courses of instruction indicates that their objectives are similar to industrial arts objectives but are not as all-inclusive.

The following material will attempt to clarify and unify concepts about elementary school industrial arts construction activity and its impact on teacher education programs of this type.

Objectives

The intent of the educational experiences in industrial arts construction activity (grades K-6) is basically an introduction to American youth of various components of the industrial culture in which they live. It is also the integration of passive and active educational units. (6:59[+]) It incorporates both mental and physical aspects of instruction.

Among the general objectives of education, an important one (too often not emphasized) is to accomplish an awakening of the individual student to an awareness of his freedom of choice and to his place in the socio-economic structure of American society. The feeling is that industrial arts, as contemplated in the curriculum and instructional program of the elementary school, can assist in this vital educational-cultural process.

Psychologically, industrial arts construction activity should be a stimulation in the process of turning passivity into activity. From the ego standpoint, this activity can manifest itself in an emotionally healthy individual seeking a partial answer in the embryo search of self.

Tangible outcomes of the industrial arts construction activity program should be evidenced in the following:

[+] See references at conclusion of article.

*Reprinted in part from Wutti, Alvin E. "Teacher Education Programs for Elementary School Industrial Arts." The Journal of Industrial Arts Education, XXIV, No. 1 (September-October, 1964), pp. 42-45.

1. Cognitive growth--(1:7)--awareness of problem-solving techniques; a storehouse of concepts and their results: a conception of standards in conjunction with industrial arts materials-tools-equipment usage; a realization of individual potential (in construction activity); further awareness that mental activity (in the majority of cases) precedes physical activity; and the development of intellectual abilities and skills for positive transfer-of-training and usage.

2. Affective growth--(1:7)--resulting in a healthy state of emotional outlets: a feeling that creativity is a normal process and inherent in every individual in varying degrees; a feeling of competency and an identity of individual self; a possessor of motivating forces "I can cause things to happen or to be done" under control; a self-satisfying feeling of being alive (having interest in life); bringing about changes in values, attitudes, standards, and interests; the making of adequate personal life adjustments.

3. Psychomotor growth--(1:8)--the development of manipulative motor-skills; a confidence that develops as the student recognizes advancement or build-up in motor-skill competency; technical competency based on technical skills and the recognition of this ability in others; a private ego-identity based on motor-skill success ventures and the security of feeling it brings.

These goals, cognitive-affective-psychomotor, need to be coupled with factors of child growth and development, learning objectives, teaching methods, characteristics, and needs of children age six to 12 and industrial arts construction activity procedures in order to assure a positive instructional program.

It is pertinent to the educational problem that each of the aforementioned goals be recognized as both a group and an individual problem. The variances within growth and development of the child are many and complex. Maturity, or its development cannot be recognized by skeletal growth alone. Muscular growth, organic development, and dentation all combine to form individual characteristics and needs which affect student awareness and retention in the instruction being covered. The teacher must constantly bear this in mind when conducting his class.

A review of Heil's report (2:68-74) indicates with clear evidence that the teacher's personality has a measurable effect on pupil progress in academic and social growth. Without going into detail of subject-matter, a glance at Chart 1 indicates to the reader an idea of the complexity of variables that interact between teacher and student personalities during any given period of contact.

	STUDENT TYPES			
TEACHER TYPES	Opposers	Conformers	Strivers	Fearful
Turbulent	?	?	?	?
Self-controlled	?	?	?	?
Fearful	?	?	?	?

CHART I. Teacher Behavior Related to Achievement of Students

The teacher must analyze self and the types and numbers of each case in the student categories with which he works. It should be apparent that students cannot be taught en masse or in an identical manner. Each student requires special handling according to character and personality types.

Because of the integrated nature of instruction in the elementary school industrial arts as such loses its identity. This means that, in many instances, the construction activity enhancing the passive academic unit being taught is thought of as science, social studies, creative drama, mathematics, and the like, and not as science and industrial arts, social studies and industrial arts, creative drama and industrial arts, or similar combinations. There is nothing wrong with this type of integration providing the same type of emphasis in instruction is put upon both the social studies and the industrial arts in the teaching unit.

Administration

According to returns of a national survey now being conducted, the program of elementary school industrial arts is carried on under the following personnel (8):

1. Elementary teachers in the self-contained classroom.
2. Elementary teachers assisted by industrial arts specialists in the self-contained classroom.
3. Elementary teachers in the self-contained classroom and also a separate industrial arts program conducted by an industrial arts specialist in his laboratory.
4. Industrial arts as a separate subject, no construction activity in the classroom only in the industrial arts laboratory.

This indicates a wide variety of programs in action.

Organization

Organization and function of the elementary school industrial arts is wide and varied. Reports from across the nation indicate the following areas are included in this work (8): (1) cork, (2) clay, (3) ceramic tile, (4) copper foil, (5) copper enameling, (6) electricity, (7) fiber glass, (8) freehand shop drawing, (9) leather, (10) finishes, (11) mechanical drawing, (12) plastic, (13) papier mache, (14) aluminum, (15) reed basketry, (16) sheet metal, (17) styrofoam, and (18) wood.

Of the 18 areas mentioned, the average program being carried on includes only four to five of these areas. Each teacher, specialist, consultant, or supervisor selects those areas best suited to the needs of his instructional program.

These material areas are integrated with the following teaching areas (8): (1) arithmetic, (2) art, (3) creative dramatics, (4) home economics, (5) language arts, (6) music, (7) physical education, (8) penmanship, (9) reading, (10) science, (11) social studies, and (12) spelling.

Again, each teacher selects those teaching areas that best fit his or her instructional needs integrated with industrial arts. The average teacher mentions about a three-area integration with industrial arts.

Methods of Presentation

There seems to be common agreement that basic areas of presentation (teaching methods) should be used in combination for best communication results in industrial arts construction activity. These are: (1) lecture or audio, (2) reading or visual aids, (3) demonstrations, (4) trial and error, and (5) conferences or discussions.

The more these are used in combination, the higher the percentage of retention of concepts presented.

In most cases the project is the vehicle for instruction. There should be no stipulation that the student must follow a teacher-composed, project-choice, and job-plan procedure for every phase of instruction. After a foundational experience, the student makes an individual or group problem and choice. Some students immediately show an independence with a spark and sense of creativity; these students should be permitted to follow their individual paths. Others (who have automatic or bureaucratic parents and/or teachers) want to be told what to do step-by-step. This type of student must be accommodated for his peace of mind and emotional stability, but can be gradually weaned away from this type of dependency and can be taught to have confidence in his own decision-making concepts.

Facilities

Facilities for the self-contained classroom usually find a large bench in the rear or corner of the room (with either fixed or moveable vises), plus a tool panel (also fixed or moveable) adequate for the average type of construction activity carried on. Additional facilities in the form of a small industrial arts lab containing benches, sawhorses, hand tools, electric sander, electric drill, a grinder, jigsaw, and even a bandsaw provides an ideal setting for industrial arts grades K-6.

Because of individual problems of physical maturity and skills, certain equipment needs to be scaled down in size. Sawhorses with flat tops 12 to 14 inches high, benches 24 to 26 inches high, hammers 10 ounces to 14 ounces in weight, back saws 12 to 14 inches in length, panel saws 18 inches long, and similar substitutions on other hand tools and equipment are advocated.

Guidance Principles

Lay personnel in a formal guidance program is the classroom teacher; he must constantly be aware of this function in dealing with students.

The entire basis of construction activity is to make it learner-centered rather than teacher-centered. (7:45) The teacher, as a mature adult with many years of variable experiences behind him, can to a degree project an insight into the formation of areas in education which prove basic to the foundation of each student's thoughts and actions. There is no crystal ball into which one can gaze and predict the future for each student. It therefore behooves the teacher to provide experiences which will best assist the student in broadening his nature and clear away mental cobwebs in planning for his future in the American economic-industrial culture.

Guidance is the formal name given to this process in education. The implication is that, directly and indirectly, we are concerned with the personal, social, educational, and occupational adjustment of each student. A brief explanation of these factors is given:

1. Personal adjustment--attitudes, interests, morals, values, and standards. This is an inner concept, very often difficult to measure.
2. Social adjustment--factors dealing with inter-relationships with others.
3. Educational adjustment--the awareness of cultural impact and practicality of each academic subject and its use in life and in preparing for the future. As Riesman points out, this is the basis for the "inner-directed" or "other-directed" individual. (4:79-85)
4. Occupational adjustment--an understanding of occupational choices according to abilities, interests, educational backgrounds, and formal training; and the way to prepare for, enter into, and advance in the field of his choice.

The total program is one of building an image of a positive American in a positive democracy, regardless of the status of the socio-economic occupational choice.

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INTRODUCING CHILDREN TO INDUSTRIAL ARTS*

Ask any group of elementary school teachers their concept of industrial arts in the elementary school. Their replies will be varied and confused. They'll first say construction, wood-working, shop work, building things, or using hammers and saws. If you probe further they may add doing things with one's hands, crafts, or weaving. Their concept of industrial arts is a narrow one and stems from traditional ideas about it.

Ask any industrial arts educator for a simple definition of industrial arts and he will say something similar to this: "Industrial arts is a field of general education involving study of the means by which man changes the raw materials of his environment to meet his daily needs." We will all accept this statement. However, school programs vary according to the interpretations of this basic definition.

Elementary School Industrial Arts: Defined

Let me enlarge the simple definition to a broader interpretation for an elementary school program. First we must remember that industrial arts is the study of the total technology of man. The changing of raw materials must include all industries, all industrial processes, such as the milling of flour or the making of glass. It includes all materials, for example, the third curdling stomach of a freshly slaughtered calf which yields the enzymes of rennet, important to the cheese industry. Raw materials to be considered are not just wood or metal or plastic, but also sand, grass, milk, hides, cotton, and so on, ad infinitem.

To change raw materials we use tools in great variety, not only the hammer and saw, but also fire, the lever, the electric magnet, the deckle and screen--in fact, all tools produced by man's ingenuity to help the processes of changing raw materials. Machines are also tools, and by this we mean the gamut from the wheel, the handchurn or handloom, to the engine or motor and other powered machines.

Our emphasis then is upon industry. To interpret industry, children need to consider not only processes, tools, and materials, but also products, occupations, and work patterns, accumulated knowledge and problems of life related to industry, and the means by which man has adapted his physical environment to serve his needs. The dignity of work, an individual's contribution to society, and interdependence within a society are of concern.

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*Reprint of Scobey, Mary-Margaret. "Introducing Children to Industrial Arts," The Journal of Industrial Arts Education, XXV, No. 4 (March - April, 1966), pp. 24-29, 62.

Though the heart of the industrial arts program is its manipulative activities and concrete experiences, the broad definition of the program includes more than "doing" with the hands or the use of tools. It includes all aspects of study and learning: reading and research, observing, discussing, experimenting, recording, construction, problem solving, and determining relationships, or thinking. Through a balance of these methods of learning, children develop an intellectual understanding and appreciation of the ways and means by which products used in daily life are obtained and prepared, and their influence on society.

The emphasis on a varied approach to the study of industry help children understand people--their own people, and the people of other communities and nations and cultural groups. It relates men to their culture, provides deeper meanings about the child's own life. Thus we are helping children develop concepts and generalizations, the big ideas so important to the education of the young.

Industrial arts cannot be limited to crafts. In today's milieu of educational criticism we are challenged to teach solid content and develop positive attitudes and values. I don't believe we should waste time on some crafts as part of the industrial arts program. Teachers have shown me, and I have seen in industrial arts exhibits, such items as plaster-of-Paris Christmas trees, paper mache maps, jigsaw puzzles, and tooled leather wallets. Do not misunderstand me. I am not saying that experiences such as these are not valuable for children. I just don't want to take time for them from our program. We have too much else to teach!

Then we can ask, if not crafts, what about creativity? Much of the work in industrial arts is the reproduction of authentic processes and the use of authentic materials and tools. Such reproduction in itself is not very creative. Because of the need of authenticity, we cannot allow children to "create" parchment out of oiled wrapping paper. But we must remember that man has always been creative in the way he formulates, decorates, and arranges things about him. We can help children appreciate the functional yet aesthetic lines of a ship or a vase, the texture of hand-made papers, or the colors of natural clays. Then when the student understands basic authentic processes, he can advance to more creative development of the processes or more creative designs of the product. Creative thinking involves insight and interpretation of why and how people changed raw materials and the effect of these changes on their way of life. Creative thinking also is developed in the way children solve problems.

Industrial arts in the elementary school, then, is the authentic, all-inclusive study of industry and the technology of man. What might this include? What categories are to be considered? Industrial arts educators have classified industry in various ways. The most appropriate for the elementary school program, I believe, is a combination of the old Bonser and Mossman group, and those of Warner and associates. Of their categories, I believe five are appropriate: food, clothing, shelter, transportation and power, and communication.

Industrial Arts in The Curriculum

So much for our broad interpretation of the definition. Now how does this concept of industrial arts fit into the elementary school curriculum? First, ideas and problems related to industrial processes need to be presented to all children by all teachers, because we have agreed that industrial arts is general education. Therefore industrial arts should be an integrated part of the total curriculum, supplementing and supporting, with knowledge unique to the field of industrial arts, the social sciences, mathematics, science, and the arts. Industrial arts cannot be a separate subject because industry is inherent in all phases of life. Fortunately subject-matter barriers tend to be broken down in the elementary school, particularly within the organization of the self-contained classroom, and disciplines are used in functional relationships to each other. For example, a child may use skills of penmanship and spelling, reading, and composition, to prepare a geography report on the natural resources and their uses in Brazil, which of course includes content from industrial arts.

A popular system for integrating subjects in the elementary school is the curriculum unit or experience unit, usually based on a social studies theme. Professor Dorothy G. Petersen explains this well in her article in the March-April 1965 issue of The Journal of Industrial Arts Education. I feel the most effective way to introduce industrial processes is within the social studies unit because of the close relationship of industry to the social sciences and to all phases of man's life. Let us analyze this relationship.

A social studies unit usually consists of the study of a group of people. To achieve depth, the study may be centered in the basic human activities, generally listed as food, clothing, shelter, transportation, communication, education, government, recreation, religion and aesthetic impulses. Now think of the raw materials man has learned to process. It is obvious that they are directly a part of any study of food, clothing, shelter, transportation and communication. There is also, of course, a direct relationship to recreation and the arts. The relationship of industrial processes to education and government cannot survive in a modern society without the products of industry.

If we list the social sciences separately, we count about eight of them: history, geography, economics, sociology, anthroplogy, political science, and according to some authorities, psychology and philosophy. Some teachers organize their curriculum around these separate social sciences, so let us see how the study of industrial processes relates to each of the social sciences. The relationship is very close in some disciplines. History would be incomplete without a consideration of the development of the wheel, the craftsmen of the Renaissance, how Napoleon won his wars with canned food, or the influence of the steam engine and the printing press. An integral part of the study of geography includes natural resources, the materials of industry, and their influence upon life patterns. In economics the production and consumption of goods are the core of the discipline. Anthropology, or the science of man and his works, cannot ignore the artifacts of a culture. In other social sciences--sociology, philosophy, and psychology, the relationship of the industrial process is less well defined. Nevertheless, material inventions and man's work influence to some extent the social organizations, values, and the psychological orientation of man.

Currently, curriculum developers use the "big ideas" from the social sciences as the framework for the unit of study. I note that Ginn & Company's new scope and sequence for sciences is outlined by using such big ideas. The development of industry and its influences are among the concepts and generalizations with the elementary school curriculum.

In any study of present-day America, hisotrical America, or contemporary or early groups of people, learning about the society's technology is important to the understanding of the culture.

The Role of Specialized Personnel

In all this discussion we have mentioned only the role of the teacher in the self-contained classroom. The role of the specialists in industrial arts is clear. The industrial arts professor has a real challenge to introduce courses that will help the regular teacher become familiar with industrial tools and processes and at ease in teaching about and using them. The industrial arts supervisor, being familiar with the elementary school curriculum, collects data, materials, and tools that can be made available and of help to the classroom teacher in raising the level of instruction. The industrial arts teacher with a laboratory for specialized work can act as a consultant to both teachers and children, and make his laboratory a center for group projects that are his specialty.

Selection of Content and Activities

Now let's consider another aspect of the industrial arts program--the selection of content and activities, and the authenticity of these experiences. We should make a critical analysis and evaluation of the activities within our elementary school industrial arts program for several reasons. One is that the broad emerging concept we have been discussing demands authenticity, genuine bases, and truth. Also, common criticism implies that industrial arts is just "busy work" and not of academic quality. Some teachers are not trained in this field well enough to select effectively. And finally, we sometimes take the children's time in school without assuring real learning as a result.

Today we have accumulated such a wealth of knowledge that we cannot expect to teach it all to a child. Scientists cannot know all about a science; one specializes in one small part of the field of biology, fossil pollens, and even then complete knowledge about it is almost impossible.

To make choices in content, teachers need to clarify their purposes for each experience; they need to be conscious of why the experience was chosen. Teachers must make choices based on whether the activity is worth the time and effort, on the amount of learning that actually takes place, and on the relationship of this learning to the total educational program.

One of the best classifications for levels of authenticity that I know is found in Ernest Horn's Methods of Instruction in the Social Studies, published in 1934. His Chapter X, "Sources of Concrete Experience," is still most helpful when we consider authenticity of industrial arts activities. The term, "authenticity" here is used to denote effective and appropriate content, and real, genuine, authoritative experiences.

Horn identifies four levels of authenticity. The first and lowest level, completely unacceptable, involves the realm of imagination and fantasy. Activities at this level are largely fanciful, almost wholly and sometimes dangerously erroneous. Horn's example is an Indian peace pipe represented by a large bowl with enough sanitary straws so that all the members of the council can smoke at once. Another example he cites is the Indian tepee made of paper, typifying shelter for a tribe that never used a tepee! We can include the use of those familiar folded triangular paper hats to represent soldiers of the Civil War. Actually, the style of hats of each war have been unique, but even Napoleon's tricorn was not similar to these folded newspapers. Then is oiled wrapping paper for parchment permissible? Or paraffin for colonial candles? These things are the fabrication of the imagination; they are not based on fact or research. They are what the teacher or the children think might be true. However we must remember that Horn was writing in 1934. I hope that we do not find much of this erroneous representation in our schools today. Teachers know the value of factual research.

The second and next lowest level of Horn's classification is also not acceptable. Here is a more dangerous level because we still see a good deal of this in the schools. Horn calls the second level that of illustrative construction, (especially of paper). Much illustrative construction is usually far removed from reality and distorts rather than clarifies the concepts children are developing. Horn uses as examples all paper construction of things such as canoes, trees, bridges, castles. I remember walking into a third grade classroom that was involved in a unit on the community. There, all along the wall, thirty-three paper bags were Scotch-taped to the floor, upside down, with windows and doors colored in crayon. What learning did the children gain from this exercise? Not even our old flats in San Francisco, or the marble-porched row-houses in Baltimore looked as much alike as these paper bags. And the arrangement was far too fragile and crowded to be used as a set for dramatic play.

Horn includes in this category representatives in sand, clay, and similar materials, like a castle of Portland cement with crumpled silver paper in its moat. I would like to include representations made of plasticene, for I see very little authentic use for this material. Horn's mention of the castle reminds us of sand-table representation, and I most certainly include sand-tables in this unacceptable category. You know what I mean: There is a table about six by four feet, with edging around it; it is covered on the surface with large sheets of paper, and a blue river is painted diagonally across it. Green sponge trees on sucker sticks are set up, paper canoes lie in a quiet backwater of the river. Then there are paper tepees. Let us assume that this tribe did use teepes, and the children found out about and depicted the correct status arrangement in relation to the chief and that they reproduced authentic designs on the tepees. Dolls are designated as Indians at various tasks in this three-dimensional Indian village. All this takes hours and hours of work over a period of weeks to complete. And when it is completed, what do you have? A pretty thing to put aside and save for show during Public School Week! The children cannot use this for dramatic play because it is too small and not flexible enough in arrangement. And what have the children learned? That a particular Indian village needs to be near a river; the status arrangements of shelter; Indian design; some village work responsibilities. But wouldn't this same learning have been achieved if the children had produced a large mural, or a series of large pictures of this village? And the visual material could have been completed with far less time and effort. The extra time could have been utilized to tan leather, make jerky, or produce a corn-meal mush the way the Indians did. Such experiences would have given the children concrete understanding of the daily problems of these Indians.

Another construction activity that might be included in this second, unacceptable category, is the diorama. Usually, these are not related to industry. I once saw a classroom where all 36 sixth-graders had each produced a diorama of some Canadian scenes. They were in fact superficial, mostly scenes the children thought might be appropriate for Canada, or a poor representation from a picture in the textbook. Isn't this a waste of time for 36 children? Perhaps if a committee found it necessary to construct a diorama to illustrate a report, and they used accurate scale, accurately represented features, and produced a feeling of reality, an occasional diorama could be effective.

Horn's third level is acceptable. He identifies it as the reproduction of working models on a higher intellectual level than those of the paper construction: Small models are constructed because the real thing is impossible, yet one uses authentic materials and design for the models. A dugout canoe is actually burned out as the Indians did. A miniature model of a sod house is made of sod cut from turf. Or there could be a working model of a pump. Not much is done with some of these models when completed, except to put them away for Public Schools Week. But when the children build the models, they learn something of the problems of construction, such as notching logs for a cabin or setting adobe bricks in the proper fashion. From a working model they learn simple principals of physics, or mechanics, or whatever the model demonstrates.

Models are not entirely authentic because the size of the structure and the tools used are different from reality. For example, the differences in construction problems are great when building an adobe home of small 2" x 4" adobe bricks rather than 40-pound 18" x 12" x 4" bricks. Children need to consider the problems of raising a wall above a man's head and of constructing a roof at that level, when their model is not this large. Also children need to be conscious of the difference in tools used by American pioneers or by the rural Indians of Peru.

In this third level we can also classify the wooden transportation models that are so familiar to our industrial arts program. Certainly models of trains, trucks, and airplanes are not entirely authentic because none of these are made of wood today. But we can justify them on several basis. They are authentic in design. They develop an authentic vocabulary about the various parts of the model. While making them, children learn how to use carpenter's hand tools safely and effectively. Also, they learn to start a project and carry it through to the end, solving problems as they occur. Probably the most important justification for wooden transprotation models is their use in dramatic play. Through dramatic play, children learn the importance of trucks and planes in our daily life, and the interdependencies necessary to their use.

By the way, I am sure many of you believe as I do, that children should not be given chart-like and explicit instructions on how to build a model truck. This practice is like having all the youngsters in Woodworking make identical bookends, followed by identical tie racks for the second project. Children should find out about the model they wish to construct, collect pictures of it, determine which manufacturer 's design they will reproduce, then work out the construction on a problem-solving basis. All pick-up trucks do not need to be exactly 14 inches in length. But a pick-up truck does have to be shorter than a trailer rig or a fire engine. Actually, children can make models that look more like present-day, steamlined trucks than most patterns which represent trucks designed forty years ago.

The highest and most acceptable level of Horn's classification is that of real processes. Here are some examples or real processes. Collecting acorns, examining them for worms, drying, grinding between stones, leaching and boiling them to mush. Extracting rennet; producing casein. Processing sugar from sugar beets, cane, or other sugar-producing material. Making pemmican; smoking fish; producing salt. Preparing, spinning and weaving wool, flax or cotton; spinning ropes; caring for silk worms and unwinding cocoons; constructing looms; experimenting with natural dyes; making soap. Dipping or molding candles; fashioning lamps; weaving baskets of reeds and grasses; making paper; making quill pens and inks; bookbinding. Constructing primitive instruments. Finding, gathering, preparing and modeling clay utensils; preparing quicklime and mortar. Constructing a split-log stool; fashioning an hour glass; a telegraph set, or a water wheel. Also there are many other processes related to food, clothing, shelter, transportation and power, and communication will help children understand the life of contemporary societies or people of historical eras.

The Value of Industrial Arts Experiences

A hundred years ago Herbert Spencer wrote a famous essay called "What Knowledge Is of Most Worth? " Ever since, philosophers have tried to answer this question and curriculum designers are still attempting to select the most worthy subject matter. Today knowledge is accumulating so rapidly that selection of sample topics to teach is one of the most difficult tasks. Therefore anyone who proposes that certain kinds of knowledge should be a part of the school curriculum must be ready to defend his selections. We need to ask the question, "What can children learn from an authentic study of industrial processes? "

If related to a social studies or curriculum unit, children gain insight into the practical lives of the people studied. The child who cards wool and spins it not only understands the skill involved in spinning a fine yarn, or how uncomfortable woolen underwear might be if knit from the rope-like yarns he spins, but also realizes how much of a colonial woman's life was spent in preparing woolen fabrics for her large family. Pupils who dry, grind and leach acorns in a sand pit find out how much labor it takes to produce acorn meal. They also learn one reason why Indians had such poor teeth. The class that evaporates ocean water for salt can better understand the ingenuity of primitive peoples who used this product as a means of trade.

If the industrial arts activities are related to science or math studies, children gain richer appreciation of these subjects. Constructing an abacus gives practical application to the number system, using accurate scales gives practice in mathematical computation. Fashioning tools for weather forecasting such as the thermometer or wind-sock creates an aid in collecting scientific data. Experimenting with various fertilizers reveals scientific facts.

Children can also develop deeper appreciation of the arts and the artistic and craftsmanlike product. Preparing natural dyes or paints of local clays brings finer perception of the chromatic variation of color. The experience of weaving a bsket of reeds and grasses provides children with a personal measure of how difficult it is to produce a complex design in basket weaving. And they learn the importance of the skill of the craftsman in selecting and preparing the right materials to produce an excellent product.

Through industrial arts experiences, children can gain knowledge producing greater insight into history, literature, and literary references. A pupil who separates the seed from the cotton fiber by hand can more fully appreciate the importance of Eli Whitney's invention of the cotton gin. The group that struggles to fashion pens out of goose quills will find deeper meaning in Wordsworth's sonnet:

> The feather, whence the pen
> Was shaped that traced the lives
>   of these good men,
> Dropped from an angel's wing.

Or the child who prepares local clay, fashions and fires pots from it, and learns the potter's vocabulary while doing so, discerns more vividly the meaning of Oliver Wendell Homes' words:

> If we are only as the potters clay
> Made to be fashioned as the
>   artist wills,
> And broken to shard as we
>   offend
> The eye of Him who made us,
>   it is well.

There are other academic skills to be gained through industrial arts experiences. The child who uses the library to find out how soap, cheese, or coffee was first discovered is learning important research skills. The industrial arts activities stimulate this kind of research. Experiments with various mordants during the dying process help the student collect and record relevant data, as well as develop keen observation and an experimental attitude. Also, most industrial arts experiences demonstrate to children the fact that knowledge can be gained in ways other than verbal communication--through concrete experience.

Through our program, children learn the contribution of the natural environment, particularly of plants and animals, to the daily life of mankind.

Those who process flax can understand that the fibers of many kinds of plants are used throughout the world for ropes and fabrics, and are processed generally in the same way. Preparing soap gives a pupil another use for animal fat, as well as an excellent example of chemical reaction. Making mortar of seashells lends further insight into man's ingenious use of animal life.

Children can look at common things with greater comprehension of their construction. For example, the child who builds a model adobe brick house can distinguish between the strength of masonry with overlapped bricks and that of bricks placed geometrically vertical. A girl who has woven upon a loom can distinguish the warp and woof of woven fabrics. Marble-topped tables, currently so popular, have greater esthetic meaning to the boy who has experimented with the hand-cutting of hard stones.

Children experiencing a wide range of industrial processes will have a practical basis for their own leisure-time activities which are of increasing importance in an era of abundant leisure. The care, safety factors, and skill in using hand tools can be a boon to boys and girls alike. Students who have learned to warp a loom and weave, to prepare and fashion clay, to make block prints, can use these skills for fun and relaxation. And very important is the child's discovery that it is not too difficult to use the hands in manipulative activities.

Certain personal habits of value can be developed as children work out industrial processes, such as pride in doing a job correctly and well; ability to start a project and carry it through to completion; knowledge of the importance and care of tools; sensitivity to safety and the development of safety habits.

Perhaps the most important of all justifications for industrial arts is the knowledge the children acquire about the processes that are used to create the things we use. John Dewey established his laboratory school in Chicago with a curriculum centered in occupations. He did this for three reasons: Children, he said, are intrinsically interested in the work performed by adults and the jobs their fathers have. He also believed that by manipulative processes children were able to discover for themselves and gain deeper insights than through verbal experiences. His third reason, even more important today, was that children in an impersonal urban culture no longer have the opportunity to experience production first hand as they did a hundred years ago in the rural, agrarian culture. For example, a small child today might know in which store to purchase butter, and that it was yellow stuff wrapped in paper and cardboard. But knowledge of the raw materials and the process by which it is produced we must teach them. And what more do children know about shoes than the stores they buy them from and the machine that the salesman uses to fit them?

Almost all of what children learn about the production of the things they use in daily life must be taught to them outside of the family. As we evaluate the variety of knowledge and skills needed by children, we can see that the contnet of the field of industrial arts weaves its way through every discipline and becomes an integral part of the elementary school curriculum. Let us introduce more children to industrial processes.

PRACTICAL ARTS IN THE ELEMENTARY CLASSROOM*

There are many forces at work in and out of the modern school which affect the type and quality of experiences provided children. Some are positive and salutary in effect; others are negative and retarding, but all need to be accounted for and reckoned with.

Though we regard learning, particularly at the elementary school level, as a unitary process, it is entirely proper and even necessary that on occasion we separate or isolate one or more of the many areas of learning from the whole for purposes of investigation and inquiry. Practical arts work, because it is relatively new as a method and area of learning in the elementary classroom, requires that consideration be given to certain of its unique elements if it is to be successfully practiced.

At the elementary school level, practical arts may be viewed both as a subject matter area and a method of learning. The subject matter of practical arts finds its source in the knowledge and skills associated with the home, community, farm, industry, and business-areas representing vital elements of our culture, past and present, which merit active interpretatation to and by the child. As utilized in the school practical arts taps a vast potential of subject matter. Scaled down to the experience level of elementary school children, this subject matter area contributes to the child's education just as do the social studies, health, music, fine arts, etc. Whether it be constructing science learning-devices, making clay or papier mache' utensils, designing and sewing clothing for character dolls, planting and caring for a school garden, preparing simple foods, or writing and duplicating a grade newspaper, the child is actively engaged in learning about tools and materials important to him now and later.

As a method, practical arts approaches learning actively through self-activity and self-expression. It is valuable as an agent of learning in the experience unit for it cuts horizontally across other subject matter areas providing added intrinsic motivation and incentive. Children see reasons for reading, writing, and talking about things they wish to construct. Estimating, measuring, counting, and calculating are happily carried on as a real and necessary part of the work in group construction projects such as the panorama, diorama, or child-size project. Practical arts, as a method, serves to reenforce abstract and verbal studies with practical experiences which have interest and meaning for the child.

The writer recently undertook the problem of isolating and examining factors affecting the use of practical arts in the elementary school. Factors

*Reprint of Chamberlain, Duane G. "Practical Arts in the Elementary Classroom," The Journal of Teacher Education, VI, No. 3 (September 1955), pp. 189-192.

affecting the use of such activities were approached statistically through data supplied by two groups of teachers from schools in Michigan organized on the self-contained (one teacher) classroom basis. These groups were (1) elementary classroom teachers who *do use* practical arts activities, and (2) classroom teachers who *do not use* such activities. The data, provided through questionnaire and interview, were statistically manipulated to test whether there is a difference in the degree to which these factors are present in each of the two teaching situations presented by the teachers.

A few of the findings disclosed by this investigation are discussed on the following pages.

Cost

Cost of instructional supplies are greater when practical arts work is employed by the classroom teacher. The average amounts spent per year on instructional supplies as reported in this study were $46.10 for teachers using practical arts and $18.10 for teachers not using practical arts. This finding helps in some measure to discredit the rather common fallacy that a good practical arts program may be carried on in an elementary classroom entirely with salvage and scrap material.

It was further disclosed that **the average teacher using practical arts spends twice as much of her own money on instructional supplies as does the average teacher not using practical arts.** Self-sacrifice is doubtless a characteristic of the dedicated teacher. That these teachers should find it necessary to spend a portion of what is usually an inadequate salary seems an imposition, however. Imposition or not, most classroom teachers will continue to pay for necessary instructional supplies, and, in the light of this finding, it is hoped will redouble their efforts to secure free and inexpensive material for practical arts experiences.

Administration

Classroom teachers use practical arts activities more when encouragement is forthcoming from their immediate superiors. A neutral or hands-off policy is more often accompanied by little or no utilization of practical arts. The attitude of the principal or supervisor toward the use of practical arts activities assumes special significance in view of the number and variety of factors found to bear on the use of such activities. The nature of many circumstances inhibiting the utilization of these experiences renders them primarily a responsibility of the administration. Factors relating to public acceptance, instructional supplies, equipment, and other physical circumstances pose problems that the classroom teacher cannot, and should not be expected to solve.

Classroom use of practical arts is without doubt heavily dependent on the attitude of the administration. It is reasonable to conclude that the use of practical arts will be limited in any school where they are not **actively** encouraged by those in supervisory and administrative positions.

Noise

Noise and untidiness resulting from certain practical arts activities should be regarded as factors inhibiting the use of practical arts in the elementary classroom. Noise resulting from practical arts activities is only one of several types of distracting sounds that may originate in a classroom. Clapping of hands, marching, certain dramatic presentations, and even singing can prove to be distracting and disturbing to neighboring classrooms. The chief difference probably lies in the fact that practical arts noise is not in the traditional pattern. It is a new and different noise in many schools and therefore is disturbing. It is the writer's experience that schools in which such work is the accepted practice do not generally report these noises more disturbing than other legitimate working noises.

Noise resulting from certain practical arts work is a factor, however, and cannot be easily dismissed. Because **practical arts work was found to be more often taught in classrooms that are adequately insulated,** we can conclude that more attention should be given to classroom acoustics in both present and projected housing if children are not to be short-changed. Scheduling of noisy activities at times when least disturbing to neighboring classrooms may be a partial solution to this limiting circumstance.

Untidiness

The problem of litter and untidiness resulting from certain practical arts activities can doubtless be more readily met. Efficient arrangement and use of storage facilities and organized pupil clean-up can meet most of the objections directed at this inhibiting factor.

Classroom Size

No relationship was found between the size of the classroom (floor area) and the use of practical arts. It was disclosed, however, that activity space is more often available when such work is utilized. If activity space is a factor bearing on the use of practical arts and room size is not, it follows that in many cases activity areas are supplied through superior planning and more efficient room arrangement. We can conclude that any classroom large enough for effective teaching is large enough for the inclusion of practical arts. "I do not have enough room" is seldom, if ever, a valid argument.

Teaching Load

Individual teaching load does not appear to be a factor in the use of practical arts activities in self-contained classrooms of the elementary school. One reason for not using practical arts which is sometimes advanced by teachers is "a too heavy teaching load" or "lack of time." There is little doubt that most teachers carry a teaching load that can be met only by efficient and effective methods and techniques.

In the light of this finding, however, "lack of time" is an excuse rather than a reason for not using practical arts. It is often a rationalization--a process of projecting the blame on the administration rather than facing the true reasons which may be lack of educational vision, lack of specific skills, inertia, or lack of materials and equipment.

Professional Training

Practical arts work is really a part of an enriched method of teaching and learning. It does not necessarily impose a heavier teaching burden on the teacher. It may even lighten it.

Practical arts is usually taught by teachers who have had more professional training. The clearer insights and broader viewpoints which may stem from longer professional training are apparently necessary to the utilization of these activities. An increase in the amount of general professional education for classroom teachers should result in more widespread use of the active learning methods and techniques of which practical arts is so prominent a part. Thus the present trend toward higher general educational standards for teachers may be expected to exercise positive effects on the use of practical arts in the elementary schools.

A greater amount of college training in industrial arts was found to have been attained by classroom teachers who utilize practical arts in their teaching. The amounts of homemaking and fine arts training at the college level were not shown to be factors in the use of these activities.

It perhaps should be expected that more college work in industrial arts would be accompanied by greater use of practical arts activities by teachers in the elementary grades since industrial arts provides a large segment of the skills and informations necessary to the teaching of practical arts. It seems safe to conclude that an increase in the amount of elective and required college courses in industrial arts for elementary teachers will extend the practice and use of practical arts.

Conclusion

In closing, let us view briefly some of the attributes of a school situation which favors the utilization of practical arts activities.

This school will have an administrative and supervisory staff which will encourage the use of practical arts. Activity periods will be scheduled to meet possible objections to legitimate practical arts noise if the building is not adequately insulated. Adequate classroom instructional supplies will be provided.

Classroom size may vary from large to small with activity space available, often through careful planning and room arrangement.

Teaching load may range from heavy to light.

Teachers in this school will have spent more time in college preparing themselves professionally and will have had training in industrial arts subject matter and skills. They will be alert in securing free and inexpensive materials for classroom activities. Teachers here will be paid higher salaries.

THE EMERGING NATURE OF INDUSTRIAL ARTS IN THE ELEMENTARY SCHOOL *

It is against nature to expect children to sit quietly for extended periods while they concentrate on problems and assignments that appear abstract to them. Perhaps in consideration of this alone, educators first sought types of practical arts activities that would be suitable for inclusion in the elementary school program. Long is the list of activities attempted.

Early Activities--Most of the early experimenters provided seatwork which consisted of unrelated manipulative tasks that simply provided respite in the pursuit of "more important" educational tasks. Few classroom teachers followed the early leads of Pestalozzi, Herbart, and James which encouraged making activities both realistic and of interest to individuals. For many years this braiding, weaving, beadstringing, shellcraft, fancywork, soap carving, wire bending, paper cutting and pasting, basketry, and countless similar type activities were the only practical arts in the elementary classroom. Prior to the turn of the century these types of activities may have been suitable for elementary pupils. For several reasons they no longer are.

Socio-economic Changes--Industrialization with its resultant socio-economic effects has strongly influenced all our lives. It has especially affected the educational needs of children.

When we were primarily an agrarian people, children had an opportunity to become familiar with the articles they daily used and consumed by simply being alert in their rather independent communities. The effects of the production and consumption of these products were also observed in most cases within the home and local community.

As technology replaced animal and manpower, as production became increasingly centralized, and as the pace of change quickened, the interdependence of individuals, communities, states, and nations became ever more dominant. Today the sources and production of the bread we eat, our transportation, our clothing, ourpower and utilities, and even our homes are frequently removed from our daily experience. The effects of our new productivity are very complex; they can no longer be comprehended through casual observation.

Equally revolutionary changes have occurred in regard to both occupational and recreational patterns. Prior to the turn of the century occupations were relatively stable. Children generally had an opportunity to observe people in the performance of most of the occupations from which they would one day choose. Today the majority of the labor force is working at occupations that did not exist two generations ago, and children seldom have much acquaintance with even the limited range of occupations available in their communities.

*Reprint of Lux, Donald G. "The Emerging Nature of Industrial Arts in the Elementary School," The Industrial Arts Teacher, XVII, No. 3 (January-February, 1958), pp. 6-8.

Energy that now is supplied so readily by gas furnaces, school buses, electric ranges, milking machines, power lawnmowers, delivery services, dishwashers, and similar devices has saved the younger set from an increasing number of chores that once occupied much of their leisure time. This, plus child labor laws and the movement to urban living, has left children with more leisure time than ever before.

The economic and social changes mandate that the schools provide educational experiences that once were gained in the home and community. The resultant learnings are essential to the citizens of an industrial democracy if they are to enjoy and intelligently consume their natural resources, wisely employ their human resources, and constructively use their leisure time.

Pedagogical Changes--Early elementary school practical arts activities have been outmoded by other than socio-economic changes. At the outset, disciplining the hand and mind through mastery of one skill was thought to promote the learning of any other skill. Teachers no longer look upon learning as a disciplining of the mental faculties. This once popular concept is now almost wholly discarded. It is now realized that it is important that educational experiences be vital to the pupil, that they relate to his personal needs or to the needs of his group, and that they involve opportunity for problem solving and the formulation of generalizations that will enable him to solve similar future problems and to relate new learning to old.

In addition, learning is now considered a totality of experience rather than the development of specific components. This indicates that content areas can be divided and taught separately, but immediately or ultimately all learning is integrated and it may be advantageous to promote this integration by teaching practical arts as a related part of the total program.

Another change in professional education has been the increasing concern for adherence to democratic principles in free public education. In our early schools equal educational opportunity was thought to consist of offering the same abstract intellectual tasks for all. It was reasoned that all had a chance to succeed at the one type of activity provided, therefore, all had an equal chance to be educated. It is now commonly agreed that this type school dooms some children to frustration and humiliation throughout their school experience.

Some children run faster than others, some are more imaginative, some have greater finger dexterity, and still others are unusually quick and comprehending in reading. The important considerations are that this is wholly normal, that these unique abilities offer important avenues through which individuals can experience success, and that teachers should be alert to these individual differences so that they can capitalize on them. The schools must offer a broad range of educational activities to enable teachers to develop and take advantage of unique abilities as avenues to those learnings which are essential to all citizens of a free nation.

Lack of Direction--At this point we find general agreement on the following:

1. Children have short interest spans and are naturally active; they need physical activity.
2. Modern schools must assume an increasing responsibility for orienting youngster to their cultural heritage.
3. Selectively employed activities can best reinforce academic learnings when the two are integrated.

4. A free people should seek to educate all to achieve their greatest potential; such education should provide for consumer literacy, occupational and leisure time skills, and aesthetic appreciations as part of the capabilities of a participating and contributing citizenry.

One might inaccurately conclude from this that elementary teachers universally employ activities in their classrooms which orient children to an already fabulous and rapidly growing technology, that familiarize pupils with that ubiquitous phenomenon called industry, and that vitalize and complement other learning in the total school program. Actually the nature of activities specifically designed to accomplish these ends remains illdefined, and many schools still offer activities similar to those provided during the last century.

Industrial arts is the field of general education faced with the challenge of providing suitable industrially-oriented activities to fill the education vacuum formed by rapid social, economic, and pedagogical advances. Industrial arts has not forcefully met that challenge.

Professional organizations have failed to provide leadership or guidance for the elementary teacher, the United States Office of Education provides no bulletin in the area of elementary school industrial arts, no publication of comparable stature has been written since Bonser and Mossman's 1928 edition, state departments of education, generally, have been sadly lacking in providing any leadership at the state level, and few adequate programs of elementary school industrial arts can be found at the teacher education level.

The Evident Pattern--Despite limited leadership the recognized need for life-like activities at the elementary school level has caused many to work independently to develop industrially-oriented activity programs. Admittedly some of this effort has resulted in abortive type undertakings that are industrial arts in name only. These have ranged from individual seatwork of the earliest type by a new name to luxurious layouts in which pupils cut out plywood Indians with jigsaws so they may be placed in a sand-table Indian village replete with do-it-yourself aluminum tepees and erector-set-produced horse-drawn wagons. We have discussed the merit of the former type activities, Frequently in the latter case, no attempt is made to relate the activity to how Indians shaped materials to their needs and the related problems and how this in turn relates to our attempts to meet similar needs and our resultant problems.

One of the weaknesses of activity programs is that casual observation will not reveal the value of the program. With the same type physical facilities and even the same activities maximum learning or very little learning may occur. This is the same problem that has plagued secondary school industrial arts. School board members, administrators, and even industrial arts specialists are inclined to point with pride at elaborate physical facilities and busily working pupils without concern for what learning is occuring. All those who tend to superficially evaluate industrial arts activities in this manner at any level are reminded that:

1. Activities may prevent valuable learnings. Activity for its own sake may crowd out contemplation and concentration necessary to meaningful study and practice.
2. Method is equally important as content and facilities. Dictatorial methods may force pupils to build dust pans and tin cups, but it cannot force them to seek further construction activities in their free time or cannot provide them with valuable experiences in cooperative planning and leadership.

3. Laboratory work can provide one of the few opportunities in the school program for self-discipline through experiences with objective materials. Teacher-planned, spoon-fed activities cause pupils to see the teacher as authority and the discipline required to solve problems can be blamed on meanness or lack of sympathy on the part of the teacher. However, pupils cannot blame the bubbling of plastics due to overheating or the lack of fit of a part due to improper measurement on the teacher if the individual planned and controlled his own experiences with only supervision by the teacher.

Successful elementary industrial arts activities have been developed in view of the above considerations. Pupils are increasingly being encouraged to integrate activities with academic work. When animals are being studied, pets are brought into the classroom and housed in pupil-built cage. When scenery is required for a class skit the pupils use the activity area of the classroom to build it. When intangibles are difficult to visualize or symbolize, concrete materials are employed to show application and to give meaning. Whenever possible the tools, materials, processes, and organizational methods of industry are employed in classroom construction activities. Industrial field trips are taken and demonstrations and illustrated talks are given in the classroom. Through the correlation of these activities with other studies children see industry as part of daily life and in relation to all school activities.

Teachers increasingly are finding more efficient instructional methods through integrating direct experience. Where books alone provide an uneconomical avenue to learning, other instructional aids and activities are employed. The necessity for familiarizing pupils with the technical phases of their cultural heritage is accepted, and direct experiences with solving life-like problems with life-like materials are commonly provided in the modern elementary classroom.

In conclusion, there is evidence that the apparently aimless search for suitable elementary school activities has been given direction and purpose by changes in our economy, our society, and professional education which belatedly indicate that some of these activities should be industrially oriented, provided in every elementary classroom, and related to the total elementary program. Professional direction is still lacking, but the growing need will doubtless force activity on many fronts. Perhaps the work by Comenius, Locke, Rousseau, Pestalozzi, Bonser, and Russell will culminate in a dynamic type of activity program suitable to the needs of modern youth. Perhaps we are finally approaching the time when the nature, scope, and purpose of elementary school activities will be concisely defined and generally accepted.

STUDYING INDUSTRY IN THE GRADES*

When industrial arts in the elementary school is mentioned, many educators think of a series of craft-like activities conducted in the elementary grades. "After all, " they migh say, "Isn't elementary school industrial arts the construction of objects, such as book ends, clothespin dolls, ash trays, and baskets? Doesn't the program consist of craft-oriented activities which give the children an opportunity to work with their hands?

Yes, it's true that through the above activities the pupils develop certain characteristics or skills, such as physical co-ordination, social development, understandings in basic instructional fields, and interest in further study. These experiences provide opportunities for children to work together, furnish creative outlets for them, and make possible the functional use of basic subject matter found in the elementary school curriculum. All of these characteristics of industrial arts are important and any program that produces such outcomes has a great deal of merit. However, is this craft oriented type of program the goal of elementary school industrial arts? Is elementary school industrial arts a series of constructional activities conducted simply for the sake of making projects and seeing what educational goals might be met by the chance in the development of the projects?

It is stated in the Dictionary of Education that elementary school industrial arts is "informative and manipulative work offered in the first six grades involving tools, materials, processes, and products of industry as they relate to home and community life. " This statement indicates that elementary school industrial arts must be more than repetitive handwork, busy work, or artistic expression. The emphasis of elementary school industrial arts should shift from handwork and skill development to investigation, experimentation, and development of basic understandings of the pupil's industrial society. The concept of the study of industry is an objective that is usually referred to by most people concerned with the program of industrial arts in the elementary schools.

Teacher Education Problems

Even though society is becoming more industrially complex with the use of automation, mass production, and problems of labor and management, there is reason to believe that the major emphasis of elementary school industrial arts programs continues to be concerned with "craft-like" activities. This problem has two basic facets. First, average elementary teachers as they graduate from teacher training institutions do not have a basic understanding of their technical society. Therefore, how can they teach industrial concepts if they do not have an understanding of them? It is obvious that the general education aspect of industrial arts in college is not met to its fullest extent in the preparation of teachers. In some cases teachers may have an understanding of their industrial society but do not have the experience to relate this to classroom constructional activities. Second, teachers usually do not have a knowledge of how to create experiences other than craft activities that will assist the pupils in developing understandings of industry. Some teachers think these experiences are impractical or too hard to develop so they simply skip this phase of industrial arts. However, many teachers have found that they can guide constructional experiences that help their pupils develop and understanding and insight into industry.

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*Reprint of Williams, Walter R. III. "Studying Industry in the Grades," The Journal of Industrial Arts Education, XXIV, No. 3 (January-February, 1965), pp. 54-6.

A Survey of Examples

Excellent examples of industrial arts experiences may be found in various sections of the United States. Some of these activities have been reported in the following areas:

One sixth grade in Kent, Ohio, developed an industrial unit concerned with the steel industry. As constructional activities the class built models of various pieces of equipment and machinery needed for the production of iron and steel. In an elementary industrial arts program in Trenton, New Jersey, the emphasis was placed on common materials and how they were used in everyday life. One example was aluminum. Why was aluminum a suitable material for the manufacture of pots and pans? (1) excellent conductor of heat, (2) lightweight, (3) easily formed, (4) did not rust, etc. This type of experience was extended to may different materials.

In Great Neck, New York, a fifth-grade class studied the influence of production techniques in the industrial revolution. In order to present these concepts in the classroom, it was decided to mass-produce an object. The children, after lessons on the various phases of production planning, designed, estimated the cost, and produced 35 identical objects.

While industrial arts should be designed for normal students, many industrial arts experiences may be adapted to fit the needs of mentally retarded pupils. In Bloomfield, New Jersey, a class of mentally retarded pupils mass-produced counting bars for the classrooms in the school. The counting bars were made from plastic spools, wooden dowels, wooden beads, and coat hangers. The job was set up on an assembly-line basis with the instructor carefully supervising the activities. For example, the student who drew the pattern on the base was a "layout man" and the pupils who operated the sander or jigsaw were called "operators." When it was necessary to smooth sharp edges, the class referred to it as "breaking all sharp edges." The counting bars were "assembled" rather than put together. The students who did the inspecting were called "quality control men." An exceptional education class would, of necessity, have to be assisted and told what to do in more instances than other classes of the same age-group.

A class in Shreveport, Louisiana, deposited money for stock and elected the directors and executives for a classroom company. The students decided upon and designed a product to put on the "market." They identified the economic principles involved, such as capital, natural resources, labor and market. After the product was approved, management obtained workers and set up for mass assembly-line production. The product was inspected as it came of the assembly line and was transferred for distribution. After the product was sold, the big problem of what to do with the money was solved by the class.

In Clear Lake, Washington, sixth-grade students made paper while studying a unit on forests and forest products. The children made their own paper from pulp secured from a nearby mill. On the paper they printed linoleum block prints for bookplates and Christmas cards. In some instances the "pulp" was made from old rags or "Kleenex."

These industrially oriented programs can effectively cultivate skills which most elementary school industrial arts situations claim to develop in (1) problem solving, (2) creative expression, (3) planning, (4) development of small and large muscles (5) proper use of tools, (6) effective use of materials, and (7) the development and appreciation of work skills.

Craft programs may fulfill most of the above objectives but wouldn't the development of units, activities, or projects concerned with the content area (industry) of industrial arts meet these objectives better? One only needs to thumb through some recent textbooks used in the elementary grades to see that the content area of industrial arts is included in these books. For example, elementary science and social studies books contain information about tools, machines, electricity, textiles, ceramics, trees, sound, steel production, paper making, and spaceships.

Elementary school industrial arts must be concerned with modern day technology because the main goal of elementary school industrial arts is to reinforce and supplement the elementary curriculum. It is time for industrial arts to meet its educational responsibility and try to concern itself with a study of industry. This should include much more than just a study of basket weaving or the making of pot holders and book ends.

Let us develop constructional activities around materials, tools, processes, and products of industry. We say we do-- but do we?

If elementary school industrial arts is to contribute to its fullest extent in the development of American youth, it must be concerned with helping the student develop an understanding of the present-day society of which he is so intimately a part.

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Williams, Walter Rollins, III "A Study of The Judgments of Experts and Practitioners Concerning Superior Practices in Elementary School Industrial Arts." Unpublished Doctoral Dissertation. The University of Maryland, 1963.

ELEMENTARY INDUSTRIAL ARTS AT THE UNIVERSITY OF CHICAGO LABORATORY* SCHOOLS

John Dewey's "Learn by Doing" school is one of the original University of Chicago Laboratory Schools. In fact, we occupy Blaine Hall, which John Dewey designed and built in 1903. Today it houses about 775 students (K-6) with either four or five sections at each grade level. The average class size is about 25. About one-half of our children are those of the faculty of the University of Chicago, while the other half are from wealthy families and scholarship students. The average IQ of our students (K-6) is about 125.

At present, the elementary industrial arts program (1-4) is used as a method of teaching. By method of teaching, I mean reducing the level of abstraction in other subjects by constructing, experimenting, visiting, exploring and observing for the purpose of making things easier to understand. Because our fifth and sixth grades are highly scheduled, so is industrial arts. Each student receives a 14-week session, four hours a week in either the fifth or sixth grade. Our fifth or sixth grade industrial arts is usually also related to other subject matter areas such as mural building (art), diorama construction (history), science fairs, math fairs, mass production (social studies), etc.

A third-grade class was studying the geographical aspects of both Alaska and Africa, the cultures of the people, the industries and means of transportation. After this information was gathered, Africa's and Alaska's similarities and differences were compared.

The industrial arts contributions to this class were two large wooden maps of Alaska and Africa. Using the grid method learned in math, the students drew Alaska and Africa to scale on a plywood sheet. Each map was sawed into three parts. Four students were assigned to each piece of the map for motivation to research the needed information. As the information was gathered by the students, it was placed on the map pieces. When the class finished the maps, the students were able to see similarities and differences previously not noticed. They also gave much insight into the cultures of both lands.

A fourth-grade class studied Western civilization through the study of the theatre as a vehicle. Because this class wanted to perform examples of different types of theatre, a stage was needed. The class decided it should be portable so that it could be easily moved and stored. To get a better understanding of stage construction, the class visited the high school theatre and the drama teacher, who was of great help in planning the stage and curtain.

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*Reprint of Dispensa, Joseph, Jr. "Elementary Industrial Arts at the University of Chicago Laboratory Schools," Industrial Arts and Technology--Past, Present and Future, Addresses and Proceedings of the 29th Annual Convention of the American Industrial Arts Association, Philadelphia, 1967, p. 150.

This stage has been moved from room to room in 15 minutes, but has a permanent place in the classroom where it was built and is used daily. One of many activities carried on by the students was the fabrication and use of jigs.

The sixth-grade art teacher and industrial arts teacher decided to work jointly on a mural construction project. We decided to work together, because of the art objective of teaching the elements of design and the industrial arts objective of introduction to tools and materials and industrial processes could be fulfilled in a unique manner. We worked jointly in both areas with a class of 42 students. The murals, related to the school subjects, were built with the understanding that they would be hung in the hall as a class legacy. The designing of the murals took anywhere from four to seven weeks. The whole project took 14 weeks, four one-hour periods a week. At the end of the project the class had been exposed to a great variety of industrial materials and processes.

IMPLEMENTATION OF TECHNOLOGY IN THE ELEMENTARY SCHOOL PROGRAM*

It has been stated by many authorities that the fundamental objective of the elementary curriculum is to produce effective citizens in our democracy. Thus, the elementary school has a vital role to play in getting young people ready for life and intelligent participation in helping solve the very critical and complex problems which face humanity. The elementary curriculum, much like the secondary curriculum, has weathered many fads, vogues and learning theories in arriving at its present philosophical position. And, let me hasten to add, there is by no means unanimous agreement as to what this philosophical position is, or should be. However, one of the criticisms leveled at old elementary curricula was their failure to correlate instruction around centers of application and interests, such as lifelike problems and projects. Based upon what has been proven concerning learning theories, the major emphasis today in the elementary school is on the Gestalt theory of learning, which stresses that effective curricular patterns do not compartmentalize subjects studied, but attempt to provide opportunities for the unitary, integrative presentation of subject matter. The basis for much of this integration of subject matter is called the unit. H. J. Otto endorsed this pattern of curricular offerings when he wrote, the "unit method (sometimes called the unit organization of teaching-learning situations) was evolved and is today the best-known vehicle for combining appropriate pupil motivation, learning outcomes, learning activities and an effective utilization of content. Unit method holds the best promise of enabling the pupil to acquire meaningful insights, problem solving skills, and the translation of knowledge and attitude into behavior." (1)

Thus we can define the unit as a teaching-learning organization which calls for the integration of curricular areas, which has certain distinctive characteristics of teaching, and which usually extends over a period of several weeks.

Child growth and development constitutes a comprehensive field of study and I will not attempt to cover it to any major extent. The elementary school age child is undergoing many physical, social, emotional and intellectual changes which we must understand and take into account when we are planning learning experiences for him. The above mentioned factors all contribute to an individual's readiness and ability to learn.

Another important factor to be considered in learning is motivation. Concisely we must be concerned with short-term and long-term motivation, intrinsic and extrinsic motivation, a child's level of aspiration, and the ultimate goal of self-motivation. Research tells us that intrinsic, natural motivation results in deeper, longer lasting learnings. It can also be said that children learn more effectively through participation activities, by doing rather than by passive absorption of facts.

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*Reprint of Thrower, Robert G. "Implementation of Technology in the Elementary School Program," Industrial Arts and Technology--Past, Present and Future, Addresses and Proceedings of the 29th Annual Convention of the American Industrial Arts Association, Philadelphia, 1967, pp. 195-198.

Against this very brief and sketchy background of the elementary curriculum and the elementary school age child, let us turn our attention to the implementation of industrial arts in grades K-6. If you accept as the fundamental objective of the elementary school what I stated previously, namely, to produce effective citizens for our democracy, then I doubt if any person here tonight would disagree with me when I state that to produce effective citizens we must acquaint them with our technology and the major influences technology has on our society. And the study of this technology must be an integral part of the curriculum of every grade level of the elementary school. On the other hand, I am sure some will disagree with the methods of implementation which I am going to present.

Based on the curriculum pattern which I have described and the learning theory commonly practiced today, I contend that industrial arts activities should be incorporated into the units being taught rather than attempting to teach them separate and apart from the rest of the curriculum. This does not mean that I believe industrial arts should be subjugated by the other areas of the curriculum. It does mean that I believe industrial arts should take its rightful place as a contributor to the overall curriculum. Under the unit method, just as there would be science-centered units and social studies-centered units, there would also be technology-centered units. In a social studies-centered unit, industrial arts applications might well be used as an initiatory activity, or as a developmental activity, or as a culminating activity. For example, the unit might be entitled, "pioneers" and the culmination of this unit would be for the class to use some of the tools, materials and processes of our technology and construct a pioneer home, furnishings and implements. As a part of this unit, they might dip candles, churn butter, or tan an animal skin. On the other hand, a typical technology-centered unit might be entitled, "community industries," which could well include a tour of a local plant, talks by an industrialist, and the setting up and operation of their own company with a product being produced, using line assembly techniques.

In New Jersey this past summer, under the direction of Elizabeth Hunt, state supervisor of industrial arts for grades K-6, there was established a Technology for Children project. This institute ran for six weeks and involved twenty-two children ranging in age from four to twelve, and twenty-two elementary teachers representing all grades from kindergarten to sixth grade. The children represented a heterogeneous group with equal representation of both sexes. Two classes were established, with one containing grades K-3 and the other, grades 4-6. The teaching team for each of the classes consisted of a master classroom teacher and an industrial arts specialist. The children spent three hours each morning using tools, materials and industrial processes in solving problems arising from technology-centered units which were presented. Because of the press of time, the units were not fully developed with respect to many of the other subject areas, but even so one of the most prominent findings was that even though the central focus in activity was on dealing with tools, materials and technical devices, all of the areas of the curriculum emerged to be encountered by the children in a meaningful context. These findings were documented by the anecdotal records kept by the twenty-two teachers who observed the children at work. For example, one anecdotal record revealed that the vocabulary of one child was many times the number of different words which would be found in use in a formal classroom situation. Another record revealed numerous mathematical concepts used in solving technological problems. Likewise, another record revealed the same for science concepts, and I could go on.

In addition to observing the children each morning, the twenty-two classroom teachers spent the afternoon developing expertise in the use of tools, materials and processes. Time was also spent in developing technology-centered units which they now are employing in their own classrooms.

I would further add that all of this was accomplished in regular elementary classroom facilities with portable tools, materials and work surfaces which are within the budget limitations of nearly every elementary school. This project is just one example of how technology can be implemented in the elementary school. There are many other implementations taking place in all parts of the country. Thus, I share pride with you in knowing that our curriculum area is moving back into elementary curricula across the country, where it has such a vital role to play in preparing effective, productive citizens for our society.

Some of you, by now, are asking yourselves, in the face of our ever-present critical shortage of industrial arts teachers, how we are going to staff this new frontier? Remembering what has been said about the organizational nature of our elementary schools, we should recognize that the key person is the elementary classroom teacher. This classroom teacher is the key for several reasons. First, she, with the help of curriculum specialists, is the person who determines what actually should be in the curricula which will be presented in her classroom. Second, she knows the individual characteristics, needs, desires and aspirations of the children in her classroom better than anyone else. On the basis of these two factors, she is in the best position to put the pieces of the puzzle together so that the most meaningful learning experience possible will result. In order for this to take place, it is imperative that the elementary classroom teacher be trained in the use of tools and materials and how to use industrial arts activities effectively in her classroom.

This being the case, there is a role for each of us, whether we be teacher educators, supervisors, or classroom industrial arts teachers. For those of us who are engaged in the task of industrial arts teacher education, there is the need for each of our institutions to provide collegiate level courses in the use of tools and materials and methods of incorporating technological concepts into the elementary curriculum for every elementary education major. This is being done by a few of our institutions at the present, while some others are providing the opportunity on an elective basis; unfortunately some are doing nothing at all. Greater effort must be expanded in this direction, for as these young teachers graduate and take their places in the elementary classrooms across the land, they will utilize industrial arts activities with their young charges. Yes, they will use construction activities even if their schools do not provide the tools and materials needed. This I know to be true because I have had many, many reports back from our elementary majors telling of their experiences in getting industrial arts activities started in their classrooms, first by either borrowing tools or having tools brought in my the students and then, as the results were presented, by having either the administration or PTA start providing the necessary tools and materials. I take my hat off to the elementary classroom teachers because they dare to go where angels fear to tread.

Particularly those of you who are supervisors or classroom teachers can help the elementary teachers already in the field. You can help by assisting them in getting tools, materials and work surfaces. Also, you can greatly aid these classroom teachers by conducting workshops and inservice programs where these teachers can develop their competency and self-confidence in the use of tools and materials. You can also assist by serving as a sounding board for a teacher's ideas and plans, and by offering technical advice which will greatly increase her chances of success.

I was delighted recently, when a county industrial arts association in New Jersey became so interested in the potential of industrial arts in the elementary school that they rose to professional heights by offering their time and facilities to all the elementary teachers in the county who wished to develop their skills in using tools and materials. This is a professional project which I would strongly recommend to every local group of industrial arts teachers.

Even though I hold to the position that the classroom teacher is the key person in a program of elementary school industrial arts, I do not for a moment underestimate the role of an industrial arts specialist in this program. An industrial arts-trained teacher who also understands the elementary curriculum and the aspects of child development is essential to a program of elementary industrial arts which attempts to come close to realizing its potential in the total elementary curriculum.

With his background of specialized training, the industrial arts consultant can render a valuable contribution by serving as a resource person to the classroom teachers. In this capacity, he can constantly provide technical information, review the teachers' ideas, offer unit suggestions, demonstrate tools, materials and processes, conduct workshops for teachers and assist with classroom projects. In addition, he would be the supplier of tools and materials as well as the person responsible for keeping the equipment in proper condition. Another major responsibility would be to serve as the main spokesman for industrial arts by continually keeping the administration, parents and community in general informed of the contributions of industrial arts to the curriculum. Also, he would be the person who would organize visits to industry for the students and the industrial personnel who could make contributions in the classrooms. We in the profession of educating teachers need to give greater attention to the training of this specialist. His undergraduate training needs to be somewhat different from that of industrial arts teachers preparing to go into the secondary schools.

School systems that seriously want to reap the benefits to be derived from the inclusion of industrial arts in their elementary curricula will utilize the team approach. They will employ classroom teachers who are trained in the use of industrial arts in the elementary classroom, as well as elementary industrial arts specialists. They will make available the tools, materials and facilities necessary for the program, and they will continually upgrade the program through workshops and institutes. Also, they will allow competent, imaginative classroom teachers freedom in the development of learning experiences which will be most meaningful to the students.

In summary, let me state that I am firmly convinced that technology and its implementation through industrial arts activities should be integrated into the very core of the curriculum of every grade level beginning with the kindergarten. Elementary classroom teachers must be trained in the use of the tools and materials of industry. They must also be trained in the methods of utilizing industrial arts activities. Industrial arts specialists must be trained and employed by elementary school systems and the necessary tools, materials and working areas must be provided.

Finally, technology is being implemented in elementary classrooms of many school systems, but we need to increase continually our efforts until it becomes an integral part of the curriculum of every elementary classroom throughout the country. Then, and only then, can we say that elementary schools are presenting a total picture of our society and fulfilling the basic objective of producing effective citizens to take their places in our technically-oriented society.

FOOTNOTE

1. H. J. Otto, Social Education in Elementary Schools. New York, Holt Rinehart and Winston, Inc., (1956), p. 412.

INDUSTRIAL ARTS FOR THE ELEMENTARY SCHOOL*

Civilization, as it exists today, is the outcome of man's efforts through the ages to satisfy the essentials of life within his cultural and physical environment. Man's changes and modifications of raw materials, brought about first by hand, later by machines, and now through scientific discovery and its application, have been responsible for the formation of the complex industrial culture of today's world.

During the time of early man, understanding his world was easier for a child than it is today. His needs were satisfied as a part of his daily experience through his individual efforts to aid his family. The child performed many of the actual processes himself and was a witness to those which he did not perform. Because he did these things, or knew how they were done, he was able more fully to comprehend and to appreciate the problems of the people who did this work.

As civilization developed, industry moved from the home to urban centers. The child today rarely has firsthand experience with industrial processes or even the opportunity to observe the processes himself and was a witness to those which he did not perform. Because he did these things, or knew how they were done, he was able more fully to comprehend and to appreciate the problems of the people who did this work.

As civilization developed, industry moved from the home to urban centers. The child today rarely has firsthand experience with industrial processes or even the opportunity to observe the processes in use in his home or community. It has become the function of the school curriculum to organize school life around worth-while areas of human experience within which children may live as a social group and be involved in selected basic life experiences of people with whom they come into contact.

The total number of major industries, together with those contributing to them, number well into the thousands, each responsible for its own special skills, materials, and problems. Because of the complexity of modern industry, it is necessary that selection be made of those basic processes which will contribute most toward helping children to acquire meanings, concepts, attitudes, appreciations, habits, skills, and techniques important in building understanding of the world in which they live.

Varying Emphasis Placed on Types of Experiences

Educators place a varying emphasis on the types of industrial arts experiences that may be provided in the elementary school. One group

*Reprint of California State Department of Education. "Industrial Arts for the Elementary School," California Journal of Elementary Education, XXVI, No. 3 (February, 1958), pp. 132-137.

of educators places emphasis on the industrial arts as that phase of general education which deals with industry--its organization, materials, processes, occupations and products--and with the problems resulting from our industrial-technological society.

It is the belief of those in this group that industrial arts experiences at the elementary school level begin to orient children to the industrial society of the past and present. The elementary industrial arts program, therefore, serves two major purposes:

1. The enrichment of many areas of experiences and content in subject matter fields

2. The discovery of interest, abilities, and aptitudes of the individual related to industry.

Elementary industrial arts is an area of instruction which makes a distinct contribution to the ongoing elementary program through its own subject content, methods, and techniques. It helps to clarify the concepts encountered in social studies, language arts, science, and arithmetic. The interest in the activity provided by the program usually creates additional motivation for the acquisition of knowledge and skills in other instructional areas. Industrial arts also has subject content of its own which relates to the highly industrial society of today. Fundamental skills, social studies, play experiences, personal and seasonal interests, and the challenge of environment provide many opportunities for the use of industrial arts skills and practices.

This elementary industrial arts program stresses construction activities and the proper use of tools and materials that grow out of pupil needs and interests through planned activities as well as furnishing opportunities for necessary psychological and social adjustments and for the development of desired manipulative skills.

Another group of educators places emphasis on the ways man through the ages and in every culture has changed the materials of his geographic environment to satisfy his physical needs for food, clothing, shelter, tools, utensils, weapons, transportation, communication, and records. As a study of the work of mankind, industrial arts has a sound basis as a major part of many integrated curriculum units by helping the child to realize that from man's efforts to satisfy his physical needs came the additional need of acquiring skills in the use of measurement and number, the sciences, language arts, methods of research, recording and communicating; in fact, most of the subject-matter content found in the school curriculum of today.

Through engaging in the actual work processes considered essential by man engaged in meeting his requirements for food, clothing, shelter, and other basic needs, the child identifies himself with the work and the inherent problems of the people engaged in doing the work. The result of these experiences is the development of a more sympathetic understanding of the people who do the work of the world, a humane interest in, and an appreciation of, man's achievements in industry, and a set of values which contributes to the acquisition of intelligent consumer practices.

This emphasis recognizes a distinction between crafts, construction, and industrial arts on the basis of the child's purpose for engaging in the experience. A first grade child, through making a house from a wooden box or other materials for play, is engaged in acquiring initial understandings, meanings, and concepts identified with the actual process by which the adult satisfies his shelter requirements. Limits of his capabilities for performing the actual adult process prevent him from building a real house. The extent to which the primary grade child uses what he has constructed in play determines how he will build the desired meanings and understandings inherent in the industrial processes. This is the only way in which the child's construction is related to industrial arts as such.

The performance of the actual industrial processes is limited for the child in the primary grade to those processes which have been the most simple for man himself through the ages, such as the processing of foods or the making of utensils from clay. Through these simple activities the child may experience the real process. Here the child actually uses the real materials and tools in the real ways of the home and the bakery to make bread, cakes, cookies, and the like, or by taking clay, working it, and shaping it to make a plate or bowl. To gain the desired meanings, concepts, and understandings, the original process must at times be modified to fit the capabilities of the children at a given maturity level.

Although it is sometimes impractical to perform the real processes, as in the situation described for the first grade child needing to build a play shelter, a child who has the opportunity to construct a play house from a wooden box will become purposefully involved in selecting the kind of shelter required for the situation, selecting materials appropriate to the construction, and the tools necessary; planning placement and sizes of doors, windows, and facilities to serve the pipe-cleaner dolls or other toy occupants. He builds the structure in accordance with his personal likes and reveals in his construction his awareness of the ways of the culture in which he lives. He must do the work and overcome the difficulties of construction as they occur in order for the end product to be useful and satisfying to him. He thereby identifies himself as a worker in the world and arouses in himself a sympathetic understanding and appreciation of all persons upon whom he depends for the worth-while things of life.

The real measure of the value of the experience is in the process rather than the end product. True, the product has satisfactions for the child, but the process involves the real learnings which come about through problem solving, specific learnings, enjoying the work of others, and the joy of production.

All Children Need Industrial Arts Experiences

The important item agreed upon by all educators regardless of their belief in the emphasis in industrial arts is that children should have opportunity to participate in industrial arts experiences. Industrial arts experiences are on-going; they arise from previous experiences and contribute to further experiences. Here is an area which has a rich contribution to make to each child. A good industrial arts program can accomplish the following for pupils:

1. Deepen their understanding of the content of any instructional field
2. Provide enrichment activities and experiences which clarify thinking, extend knowledge, and supply meanings which build desired concepts
3. Motivate to further study and create new interests
4. Create opportunity for functional use of language, science, and arithmetic skills
5. Give growing children opportunities to develop physical coordination
6. Provide opportunity for children to work together co-operatively and thus to grow socially
7. Provide for wholesome creative outlets for children
8. Provide for emotional growth through satisfaction found in planning and creating
9. Develop appreciation for the dignity of labor, the skill of the craftsman, and the problems of our industrial society

Elementary industrial arts experiences develop pupils' abilities in the following ways:

1. Expressing self through the creation of material objects
2. Planning the construction of objects or reproducing processes in a logical manner
3. Solving problems in the construction of objects
4. Using tools and materials wisely, safely, and with reasonable skill
5. Working with tools and materials for practical purposes
6. Appreciating a job well done

Objects made as a part of industrial arts activities should serve a real purpose. These objects or projects should not be ends in themselves nor should they be elaborate or too time-consuming. The construction of a specific object need not involve all the pupils in a single class. The teacher should stress good construction and craftsmanship. Naturally these should be in terms of the maturity level of the group. Children will gain an appreciation for good work if they have the opportunity to experience teacher guidance in establishing the highest standards of which they are capable. The ability to use materials successfully, to create and to obtain successful results, gives a child a feeling of satisfaction that may not be possible for him in other fields of instruction. The personal satisfaction of work done to the best of a child's ability and carefully evaluated, often leads to the improvement of his general work habits and standards.

Industrial Arts Experiences Adapted to Maturity Levels

From kindergarten through sixth grade, the main emphasis in industrial arts will probably be in making those items and performing those processes which do most to help children to acquire important meanings and understandings necessary to comprehend the rapidly changing world in which they live.

In the seventh and eighth grades, particularly where the school provides shop facilities, the main emphasis in industrial arts may be that of a separate subject area although there will still be opportunity to relate industrial arts to integrative curriculum units. Here, each child may have the opportunity to select the particular area of industrial arts which suits his interests and desires. Within the industrial arts field, whether it be woodwork, metalwork, or electricity, each child should have the opportunity to select the construction of, or making of, a worth-while object of his choice in terms of his capabilities. The teacher's guidance in making this selection is highly desirable, but the particular project should not be imposed by the teacher.

At the upper grade level the industrial program can continue to enrich and deepen the offerings in other subject fields. Instead of written reports in social studies or science, the child may construct models or other objects which serve to clarify thinking. The opportunity to work in this manner will serve as a strong motivating force for many children and lend additional interest to other fields of instruction.

Industrial Arts in Total Educative Experience

Industrial arts is recognized by most educators for its unique contribution to the educational program of the public schools. The importance of man's ingenuity to the development of our present civilization is an understanding children should acquire. They should discover through many experiences that it has taken man a long time to arrive at the ingenious solutions he has found for his problems. Nearly all recognize that machines, tools, and materials wisely and skillfully used are a creative force for good. Such understanding is essential in building an understanding and appreciation of the resources of the world, man's use of them, and the problems of the people who work with them. It further places in proper perspective the relation of fine arts to the industrial arts, so that the child may come to see that beauty should be a part of every object. Through a sound industrial arts program, the child may realize that such materials as the clay of the earth can be more than mere mud on the feet. It may become a crude adobe brick, a beautiful ceramic bowl, or a fine statue, depending upon man's awareness, ingenuity, and "knowhow" in using the raw materials of his geographic environment to satisfy his needs and desires.

TOWARD A BETTER UNDERSTANDING OF INDUSTRIAL ARTS IN THE ELEMENTARY SCHOOLS*

Much of the interest in elementary industrial arts springs from teachers of industrial arts at the secondary level and administrators of elementary schools who think of industrial arts as it is administered in the secondary school.

Basic and inherent differences between the application of industrial arts at the elementary and secondary levels become apparent when the elementary school is examined. These differences which bear on industrial arts may be classified as to: (1) type of administrative organization, (2) interpretation of industrial arts, and (3) method of teaching.

Types of Organization in the Elementary School

Departmentalized Organization

At the secondary level we are accustomed to having a departmentalized organization of subjects. Pupils pass from one department to another periodically throughout the day. Such a system in the elementary schools has been tried in some cities. Conceived on a departmentalized basis, it was generally known as the platoon system. Pupils often had five to seven regular subject teachers plus one or more extracurricular activities instructors. This type of organization has gradually disappeared; however, some modifications are still in existence.

Philadelphia tried a platoon system in the elementary grades for 25 years and then abandoned it in favor of the self-contained classroom on the grounds that for the young child to be subjected to so many different teaching personalities with their varying demands was frustrating. The young child seems to be too immature to cope with the rapid changes. For children above the sixth-grade level the adjustments are easier.

Having separate subject-matter teachers is thought to be more efficient. Insofar as subject matter is concerned, that theory is probably correct, because a classroom teacher cannot be expected to be specialized in eve subject. Teaching is much more than subject matter, however; the human relationships are ever present and the embryonic child must be reached in a sympathetic, friendly, and understanding manner.

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*Reprint of Duncan, Glen S., "Toward a Better Understanding of Industrial Arts in the Elementary Schools," Industrial Arts and Vocational Education, LII, No. 10 (December, 1963), pp. 18-19.

Self-Contained Classroom

At the other extreme of the departmentally organized system is the self-contained classroom equipped with regular classroom facilities, plus a laboratory area for constructional activities and even a toilet. A self-contained room, taught by one understanding teacher who provides all the different experiences for the children seems to meet their needs better, particularly in the lower grades.

There still exist some rural one-or-two-room-type schools that encompass Grades 1 through 8, but the trend to consolidate small districts and to form larger community units has eliminated a great many of them. In the lower-grades, such as kindergarten through Grade 6, the one teacher who confronts the class for all the teaching seems to be the least disruptive.

Certainly a full-time classroom teacher who understands the workings of the children's minds, their inhibitions, emotional reactions, and learning tendencies, and a teacher who feels responsible for a general block of educational experiences that will be integrated to promote normal growth and development, is in a better position to present the activities to the pupils than a subject-matter teacher who is with them for only one sixth or one eighth of a day.

Limitation of Self-Contained Classroom

The obvious limitation of this type of setup, other than physical facilities, is the teacher. If she has had training in all the activities that are considered good and wholesome for children, and if she is competent to direct them, then the self-contained room is a successful arrangement. This is assuming that she also teaches the regular school subjects, plus being ever present to foster good habits, traits, and attitudes. Her task is a mammoth one!

Combination or Modified Type of Organization

Some school systems provide teachers of art, homemaking, industrial arts, physical education, and music, who take the elementary children on schedule for a short time each day or on a staggered schedule through the week. Where facilities exist, the children move to the respective departments, but they have spent at least half a day with the regular classroom teacher. Where facilities do not exist, these activities teachers move on schedule into the regular classroom and take over the instruction directly. In some instances, they may be supervisors who bolster and support the regular classroom teacher, not directing the class themselves.

These arrangements work nicely where they exist, serving to give the pupils more vital experiences in these areas represented by the specialties of the teachers, and serving also to relieve the regular classroom teacher of her heavy task. Whether special facilities are provided or whether the activities are provided or whether the activities are carried on in the classroom, these activities, where possible, should be integrated with the regular classroom work. This necessitates conferences, sometimes lengthy, between the regular classroom teacher and the activities teacher. Herein lies the limitation. Finding adequate time for planning conferences is difficult.

Outside of campus schools teachers of the so-called special activities subjects are seldom provided. Usually, the reason is a matter of economy for the school district. We revert then, to a one-teacher situation in a more or less self-contained classroom for the elementary school. What does this mean in consideration of this teacher's job? It means that if these activities are good and wholesome for children, then that teacher must have had training in each of these areas to be qualified to direct them. They often feel that they do not know enough about certain activities to undertake them, and they continue to teach in a more academic manner. The children are thus deprived of stimulating learning-by-doing experiences.

Interpretation of Industrial Arts

The accepted general definition of industrial arts defines it as a study of tools, materials, and processes of industry plus the consideration of the human elements involved. In the elementary school, however, industrial arts becomes a device, aid or method of teaching more effectively the regular school subjects. Reading, writing, number work, speaking, spelling, geography, and social studies are usually thought of as being the regular school subjects. Every elementary teacher considers these as fundamental and basic needs in the preparation of future citizens.

Working with constructional materials and using tools and processes, the clever teacher can cultivate interest in a study of these basic needs and exact some performances from the children to promote reading, writing, speaking, and other regular subjects. For example, suppose that a sundial has been made in connection with a unit study, using pressed wood for the disk and a piece of tinplate for the shadow marker. Would it be of interest to know how pressed wood panels are made, kinds of hardboard panels, what tinplate is, what its source is, and how it is processed?

Each of these items suggests some investigative reading, maybe a written or oral report. Geographic locations of sections of the country where such industries prevail can be pointed out on maps and some insight can be given into the lives of the people who work to make these materials possible. Of course the study of the sundial as an instrument for keeping time takes us back into history; the laying out of the dial calls for a study of arithmetic.

This kind of an approach and interpretation does not rule out other intrinsic values of constructional activities--consumer information, appreciations and acquiring skill with tools. Manipulative skills are somewhat incidental at this stage and secondary in importance. Teachers who use constructional activities in their teaching have observed that: (1) they are harnessing a natural drive in pupils to manipulate, shape, assemble, create, and that such learning experiences are fun; (2) pupils place it first in school interest; (3) pupils comprehend denominate numbers more readily; and (4) industrial arts activities provide an area which is a workshop for and show advancement in growth of citizenship ideals.

Method of Teaching

Present-day elementary teachers use an enlightened approach to learning when they utilize activities in their teaching. No longer do the children have a "turn, rise, and pass" regime in the modern elementary school. Industrial arts teachers can be of more assistance to elementary classroom teachers if they understand what the classroom teacher is trying to do.

The year's work is usually laid out in a sequence of three to five or more units which are designed to give the pupils those learning experiences which are desired. Such a unit is carefully introduced to the pupils in an interesting and motivating manner. Then in a cooperative planning session the teacher and the pupils plan what they will do--they talk over what they desire to find out about this selected topic and discuss how they can get the information. These points may be listed on the chalkboard and put into a logical working order.

In the course of developing the unit, much reading and writing, speaking, and computing must be done. Social amenities, good habits, traits, and attitudes are constantly applied. There will come a time when some constructional work may be done to make the unit more functional. In a unit on "Pioneers" one fourth grade made a number of replicas showing pioneer life. Four little boys made Conestoga wagons, others made a fort as a panorama project, others wove rugs, some made implements found in early homes. They all learned songs and dances with which they dramatized pioneer days. This learning was fun.

The constructional work is not done on a rigorous schedule daily as industrial arts classes are in high school. It is used when the unit has progressed to the point where the children are ready for it. It stimulates the unit content and becomes an integral part of the learning experiences. Constructional activities may be used regularly or infrequently at the teacher's discretion.

Inherent differences in the nature of the programs of the elementary school when compared with the general pattern of secondary programs call for a different approach on the part of secondary teachers than they might pursue in their own programs. Industrial arts teachers are frequently in a position to advise or help with the elementary program in one capacity or another.

UNIT METHOD AND THE GIFTED CHILD*

The elementary school teacher can be proud of the success of the activity approach to the curriculum. It, with the broad unit and group work based on democratic cooperation, has been a way to enrich classroom instruction for the gifted. Examples are legion where pupils have projected their work into a level of achievement far beyond that found in the respective age group. Here the pupil is free and is encouraged to pursue the subject to his limits. He is stimulated by a wide variety of reading references, including primary source material in pamphlet form. He translates his efforts into real accomplishments. His variety of resources tends to inclusiveness with the pupil benefiting from rich libraries, teaching films field studies, and actual interviews with working adults.

Units centered on a social studies interest have uncovered drives on the part of the gifted student which include the gratifying accomplishments of high level organization and intensive research through reading. Here is an actual medium for the capable and motivated pupil to extend his effort to the full range of his abilities. Many a pleased and harried teacher can attest to that. The soundest advantage has been the development of learning, together with its satisfying use in a context, that makes sense to the pupil. Substance is thus given to the true concern for that resource possessed by the gifted pupil which the nation is determined to utilize, since the pupil, first of all, is trying each skill he has learned in a functional situation.

The same success is widely reached through science activities. Again, there are opportunities for the specially gifted pupil to develop insatiable reading habits with which he finally attacks authoritative writings in the area of his interests. The teacher experiences a satisfying feeling of happiness, even though he is no longer surprised, to find an elementary pupil discussing concepts that are at an adult level. The safeguards of a sound activity program are doubly important here, for such a child has been trained to test data through experimentation since his very kindergarten years. Never need such a pupil be limited to being a repository of facts.

Our schools give other examples of promising approaches to enhance the development of the powers the gifted child has through the use of unit activity and curriculum enrichment. Such a curriculum opens up the way for more concentrated work by suggesting the next ingredients, bringing in as many other trained and understanding adults as are available for contact with the gifted child. Many interested adults should stimulate him and recognize his achievement in a public manner as frequently as possible. Here is a very appropriate place for the entrance of other educators on the scene. The consultant and special teacher can join efforts with the initial work of the classroom teacher to further enhance, enrich, and complement a sound start. Most important is the realization that strong unit-oriented teaching procedures offer hope toward the complete development of the gifted right in his own classroom. It is assuring when once more the teacher has been active in getting maximum learning under way, not sitting idly by while the Rome of national intellectual resources wastes away.

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*Author and source unknown.

The gifted pupil indicates his mental superiority through his power to form generalizations. He is drawing assumptions from his work in the enriched classroom. Where inferences and assumptions are discouraged by the teacher, he actively rebels against the situation. The pupil then struggles his way through such a teacher's simple world of black and white. The gifted child's active mind is an excellent guarantee against instruction favoring "knowledge" or "empty facts."

A universally-admired quality of the gifted child is his keenness in perceiving relationships. This talent enables him to see how two likenesses or similarities will increase, or decrease, as the situation progresses. He can veritably "smell" his predictions out. He will report and discuss these with his class; that is, if he has not already been embarrassed into silence.

In the same vein of relative superiority is the wealth and profusion of associations which the gifted child forms. Each new experience has a meaning drawn from what is already rich in his memory and is given its direction by these past experiences to broaden his future background. He understands the difficult and subtle situations of which the less gifted child has not begun to perceive, or at the best recognizes as a vaguest of abstractions.

Sometimes the teacher may use the child's own abilities as a club with which to control him. This is when she assumes that, when the gifted child does not master each subject equally well, he is guilty of lack of effort. Even though there exists a positive correlation between different abilities, these relationships are too vague to justify the impatience of the teacher. Worst of all, she forgets the basic curriculum principle; that the child developed an interest into a proficiency through long and extensive practice. His father has continually led him to think and react mathematically; he has been an avid insect collector since the age of four; the fine family library has provided wide reading. With each of these the gifted child has acquired competency through interest and self-discipline over a period of many years. To expect him literally overnight to equal the level of achievement in a new and highly interesting but less familiar area is a mark of impatience, of injustice, and a seed for hesitancy concerning new ventures. It is a violation of learning principles and restricts the development of the child's unusual powers instead of promoting them.

Each teacher is always also a teacher of the gifted. Some future ideal, perhaps not too distant, is to provide special personnel to aid her when she needs it. But it is still the classroom teacher who must orient the gifted pupil in his first years of school work, accurately identifying him, and nurture him intellectually. Until that ideal future day appears, the classroom teacher has the predominent and unavoidable responsibility for his educational development.

TRY INDUSTRIAL ARTS FOR RETARDED READERS*

All of the desirable features necessary for a successful reading program for retarded readers are found in the industrial arts area. There is intrinsic interest in the area--the desire of children to make things, to engage in manipulative activity, to learn about processes, to explore, to experiment. All these are an inherent part of the industrial arts program.

The industrial arts shop offers an atmosphere in which children feel they are and can be successful. It provides a rich, varied, and enjoyable setting in which learning reading skills can be made a component part of an enjoyable activity, rather than an isolated exercise.

The industrial arts program offers a meaningful context for reading. In this area context is concrete and real, involving tools, materials, and processes. The word and the object, the written direction and the actual manipulative process, are nicely connected.

The industrial arts area provides the type of situation in which the child is encouraged to help himself, to learn by himself. This, after all, should be one of the important goals of any teaching program. Children are much more desirous and able in trying to overcome difficulties, to improve their abilities than we realize. The industrial arts program is most valuable here. The pupils are certainly interested in the "know how" of the area. If the ability to read a new word, a phrase, a sentence will help them in this strategy they will be so much more eager to read that word or sentence. Thus the real intrinsic motivation existing in this area is simply incalculable.

The industrial arts area provides a relaxed, friendly, co-operative situation closely akin to that found in the playground, involving the satisfactions and concomitants of play. Pupils are alert and eager, actively in search of clues, ready to take advice. When it is possible for the remedial reading teacher to work with children in the industrial arts shop, with its quasi-play setting, these characteristics of play can be used to advantage in helping children to improve in their reading ability.

Firsthand experiences rank high as a technique in developing word meaning and other reading skills. The many activities of the industrial arts program provide real firsthand experiences in abundance.

The Reading Program at Dewey J.H.S.

The actual teaching of reading in the shop by the reading teacher was started recently at Brooklyn's Dewey Junior High School. While it is not possible now to give any test results or data as to the effectivens of the program, there is no question of the fact that the activity had given added impetus to the reading program and the interest in reading of the pupils involved. It has awakened their enthusiasm.

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*Reprint of Ferrerio, Anthony J., "Try Industrial Arts for Retarded Readers," Industrial Arts and Vocational Education, XLIX, No. 2 (February, 1960), pp. 19-20.

The teacher has been working with two adjustment classes, composed of retarded and "reluctant" retarded pupils. She states that at first the boys were resentful--they "flared up"--because she was interrupting their shop work. It took some time to get them settled.

Methods Used

The methods used involve experience charts, flash cards, matching games, and the use of concrete objects.

The experience charts deal with the use of a tool, the care of shop equipment, good work habits, a process, safety rules. The following is an example of the material on a chart: (1) live sockets and wires touched with metal objects cause bodily harm, and (2) loose clothing may catch in machines and cause bodily harm.

Words that are similar in the sentences are pointed out. Difficult words are put on the board, discussed, and used in sentences. Individual children are given flash cards to match with words on the chart.

In one lesson, the children were learning about wood fastening. The teacher discussed this with them by having them answer such questions as "Why do we have to fasten wood together?" "What do we use to put wood together?"

Then she displayed a chart with the names of "fasteners" needed and the tool with which to work:

Fastener	Tool
Nail	Hammer
Screw	Bit Brace
Dowel	Glue, Clamp

She picked various children to get the different objects and hold them beside the proper word on the chart. Other children were given individual word cards to place appropriately next to the various materials and tools. The teacher stated that the boys enjoyed this activity so much that they did not want to leave when the bell sounded.

These, of course, are the most elementary of techniques, but the boys enjoy them immensely. For our purpose it is significant because the boys were actually engaged in reading, learning word recognition skills, and enjoying the process. A reading exercise which might be boring or frustrating to them was engaged in with success and enjoyment.

Where these can be achieved—interest, meaning, purpose, satisfaction, and success—the problems of teaching reading to retarded pupils will disappear.

Reading Techniques

The industrial arts area offers unique opportunities for helping retarded pupils learn to read. The many techniques for improving word recognition and comprehension skills can be employed in connection with the industrial arts program:

1. Label objects in the room.
2. Label pictures.
3. Use multiple choice and completion sentences.
4. Carry out directions in simple phrases and sentences.
5. Use riddles based on a tool or a process.
6. Tell the story of a tool.
7. Match illustrations with directions.
8. Make picture dictionaries.
9. Find basic word elements.
10. List words in alphabetical order.
11. Discuss processes and tools.
12. Use film strips with industrial arts vocabulary.
13. Display a large industrial arts vocabulary chart adding new words as they are needed.
14. Use commercial illustrated charts of materials and processes which include easy reading material.
15. Encourage pupils to write out simple directions and processes.
16. Have pupils keep notebooks in which new words are listed as they are acquired, or as new meanings are added to known words. These may be listed alphabetically or grouped under various classifications cutting tools, hammering tools, electrical tools, etc.
17. Have pupils make up sentences about tools for reading charts--how they sound, how they feel, etc.
18. Make up exercises in which pupils cross out the word that does not belong, e.g., cotton, wool, wood, floor, ceiling, bench, etc.
19. Read and discuss sentences which contain different meanings from the name of a tool, e.g., "Take the bit in one's teeth"; "Put your nose to the grindstone;" "Have an ax to grind."
20. List substitute words for "do," "make."
21. Do crossword puzzles including the names of tools.
22. Select family names for groups of materials: pine, oak, walnut (wood); tin, aluminum, iron (metal).
23. Make up a calendar with a word or words learned each day.
24. Make up posters illustrating word meanings.
25. Arouse interest in multiple meanings. Take a simple word such as "sharp," "smooth" and see how many sentences with different meanings the children can make up for a chart.

GUIDANCE OF INDUSTRIAL ARTS ACTIVITIES*

The teacher knows that certain understandings, appreciations, and competencies are essential for the maintenance and improvement of democratic living. The teacher realizes that the opportunities children are given to achieve these qualities democratically in their child world will affect the ways these individuals will react as citizens in their adult world.

In preplanning for leading children through an area of experience in the curriculum, the teacher lists the specific understandings, appreciations, and skills which the children are expected to gain through participation in a given unit. The teacher plans experiences which will promote the children's acquisition of these feelings, skills, and knowledges. Part of the desired outcomes will be reached as the children are guided in processing raw or semiprocessed materials and in constructing articles needed for dramatic play or illustrative purposes. Other outcomes will be realized as the teacher guides the children in the planning, research, and evaluation essential to successful processing or construction.

In order to recognize the industrial arts activities inherent in the unit which could contribute to children's growth in understanding, appreciations, and skills, the teacher must be familiar with the subject-matter content of the unit to be explored. To acquire this familiarity, the teacher may have to read widely to gain an overview of the ways industrial arts have affected the culture that the pupils will explore; collect books, periodical articles, pictures, posters, diagrams, and charts illustrative of the ways in which the people of the particular culture meet or have met their needs for food, clothing, shelter, tools and utensils, weapons, communication, and transportation, or of the processes involved in the particular industry being studied. And he may need to study films, filmstrips, and slides that pertain to the study.

Whenever feasible, the teacher makes study trips to places where information may be obtained, interviews persons especially familiar with the topic being studied, collects available realia, and notes sources from which other realia may be secured when it is needed. After the teacher has learned what industrial arts processes are a part of the culture the class will study, he selects those that will contribute most to the growth of the children in his class. The teacher performs the processes selected, records the steps used and the materials needed in the experiences, and organizes the required materials so they will be readily available for use by the children.

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*Reprinted in part from California State Department of Education. "Guida of Industrial Arts Activities," California Journal of Elementary Education, XXVI, No. 3 (February, 1958), pp. 157-165.

As in all other teaching-learning situations, the purposes of the teacher and children in relation to industrial arts may not always be the same. The teacher may want the children to engage in an activity so that they will grow in a particular understanding, appreciation, or skill, for he knows that the children's interest in processing or constructing will stimulate them to engage in research which, in turn, will help them to acquire the desirable qualities. The teacher knows that certain social-emotional experiences will provide means for developing respect for the ideas, opinions, and contributions of others and he realizes that the child will gain personal satisfaction as his contribution is accepted by his peers.

As children process the raw materials of nature, the teacher helps them to focus attention on the ways and means by which the materials are changed and on what happens to the materials as they are changed. The teacher emphasizes man's ingenuity and patience in adjusting to his local environment and changing materials from that environment to make them most usable to him. The teacher provides opportunities for the children to make and evaluate choices, draws the children's attention to the blending of utilitarian purpose with designs appropriate to the qualities of the raw materials processed, and helps pupils to compare their activities in processing with modern large-scale production methods. Children are constantly encouraged to analyze and compare objects from their own and other cultures in terms of textures, form, and color, thereby learning some of the established principles of art. As children are encouraged to draw on those principles in judging new objects, they become increasingly able to select wisely as consumers of the products of industry.

The teacher must decide which processing will be done from raw materials, which from semiprocessed, and which from substitute materials. When children cannot perform the initial processing, the teacher must then provide others means to insure that they develop understanding of the steps involved. Audio-visual aids, stories, resource persons, and observation contribute to these understandings.

The teacher must decide which processes are of sufficient importance to the study and to the group to warrant total group participation and which processes should be done by only one or a few individuals. His decisions are formulated as he asks and answers the questions that follow:

How much basic understanding important to children's lives is inherent in the process? What is the relation of the processing to the progress of the unit? Which of the children have had similar experience in previous studies? Do the children at this time need to be drawn together by the social experiences of working closely together on a single process? Does the activity involve a problem which is big enough to justify taking the time of the total group to organize and carry it through to solution?

It is the teacher's responsibility to guide children's involvement in industrial arts and to guide the children into construction activities that may become sources of rich emotional, social, and intellectual learning. It is his task to insure that the children have and recognize genuine need to construct specific articles. After the need is established, the teacher must help the children plan how to solve the problems that must be solved in order that the need may be met. The depth, length, and spacing of such planning is determined by the children's ages and their backgrounds of experience.

The children are helped to gain, organize, and present needed information to other members of their group. They are helped to use the information in designing, constructing, and evaluating the needed items. They are helped to use tools and materials successfully. The teacher constantly checks to see that correct concepts are being acquired and that acceptable study, social, and work habits are being established.

Skill in Use of Tools and Materials

As children work with lumber, they become acquainted with the characteristics of wood and the possibilities and problems of working with it. By observing demonstrations of the proper use of tools and materials, and with careful guidance in many construction activities, the girls and boys acquire skill in the safe and efficient use of tools. They develop muscular strength, manual dexterity, and eye-hand coordination. They cultivate sense of form and power of observation as with teacher guidance they establish and maintain work standards appropriate to their levels of development.

Instruction in the proper and safe use of tools begins with the introduction of hammers and nails and continues systematically throughout the elementary school years as other tools are introduced. Demonstrations by the teacher and children accompanied by discussion, experimentation, and practice with tools and materials promote children's skill in using the tools introduced. The proper use of tools and materials in constructing articles suited to the children's developmental levels promotes success which encourages the girls and boys to complete their work.

Guidance by the Teacher

Needs for the construction of articles most frequently evolve from dramatic play; sometimes they come when children need to make an object to use for illustration. Needs for processing materials usually arise from dramatic play, rhythms, construction, or research. Through discussion the children decide what they need to make or do.

The teacher records on the chalkboard the children's ideas and plans for the construction of articles. Important items are transferred to charts which are kept available for reference. The children select jobs from among those which the group has designated as important. They or their teacher write their names beside the jobs selected. Additional needs are added to the chart as the study progresses.

After the class has decided upon the articles to make or processes to do and the order in which the experiences are to occur, the teacher provides time and materials for research and discussion. Sometimes the total group engages in research; sometimes individual or small groups who have accepted specific responsibilities do it. The children are guided to find out how the finished product should look and of what materials it should be made. The amount and type of research in which children engage are determined by the maturity of the children and the availability of informative resources. The individuals or groups of children who have assumed responsibility for the construction or processing do additional research as needed to make the article and its use in dramatic play seem more real, its illustrative use more valuable, or its processing authentic.

Industrial Arts in the Schedule of Activities

The frequency of industrial arts periods depends upon the immediate situation. In primary grades and usually in intermediate grades the children engage in such activities several times each week. As they are guided to recognize needs for gathering additional information, the girls and boys see the necessity for engaging in further research before continuing with the activity. In the upper and sometimes in the intermediate grades the maturity of the children makes extensive research possible. Also in the upper grades activity periods may be less frequent than in the lower grades.

In the kindergarten and for a part of the first grade not all of the children need to participate in construction or processing at the same time. For those children who do not take part, the teacher plans activities in other centers of interest to meet their needs. As the girls and boys are helped to recognize the need for objects to be made and assume responsibility for making them, more and more children are encouraged to participate until all or nearly all the children in the group are constructing or processing at the same time. Even at this time not every child may be working with tools. All, however, are contributing to group needs by creating something to be used in dramatic play or otherwise used by the group in social studies activities. Some may be designing wallpaper for the house, painting blocks of wood for cargo, painting a background for the play community.

As children mature and begin to assume more of the responsibilities for making things to meet group needs, teachers guide all children so that they will engage in industrial arts activities at the same time.

The Teacher Plans in Advance

Each work period requires careful teacher planning. In doing this planning the teacher takes into consideration the answers he formulates for the following questions:

What new needs for construction or processing are evident?
Has each child selected a purposeful job?
Is every child progressing satisfactorily?
Are the activities and end results valuable to individuals as well as to the group?
Have materials and tools been made readily available?
Are books, periodicals, filmstrips, and other audio-visual materials available to children so they may clarify concepts?

Have appropriate group standards been established so children may work independently or in groups with success?

Have opportunities to participate in other worth-while activities been provided for the children who are not processing or constructing?

Industrial Arts Work Periods

Work periods are busy times for teacher and children. Periods are usually organized to allow adequate time for the children to clarify individual and group needs, to plan so that all persons and groups may know what they are to do and how to do the accepted tasks, to do all or part of the work planned, to clean up the room after work, to discuss progress and to clarify new problems. The amount of time and the number of children involved in planning and evaluating are determined by the maturity of the children and the complexity of the problems.

Planning is part of every work period. Early in the primary grades, and for some children even later, much planning is done "on the spot" with individuals or small groups of children. Later, as the girls and boys are able to think together in larger groups, the teacher guides them to clarify their needs and decide on procedures for the period before they begin to construct or process.

The teacher provides models, diagrams, and other informational materials which will help the girls and boys to visualize next steps in the activity. The children decide what each of them is to do, and suggestions are made as to how each should proceed. The use of space, materials, tools, and time are discussed. The length of time to be used for work is decided upon. Group-established standards for work and clean-up methods are reviewed as the occasion demands. After each child knows what he is to do, all the children start working.

Once the children have started working the teacher moves among them, checking measurements, asking leading questions, and examining their work in order to help the children to evaluate and plan improvement in their construction or processing.

If careful planning has been done, it seldom becomes necessary for the teacher to interrupt the work of individuals or those of an entire group during time allotted for active work. Most problems of total group concern which arise during the worktime may be considered later when the children convene for evaluation. If, however, during observation of the children at work, the teacher notices that the clarification of ideas, procedures, or tool usage is necessary to the successful completion of the work, the entire activity may be stopped long enough to fulfill the observed needs through demonstrations or further discussion and planning. When this has been accomplished satisfactorily, the children return to work.

The work activity should occupy most of the period. Children should not spend this part of the period discussing and sharing ideas, but should work actively. A child cannot saw a straight line nor sand wood effectively if he is talking. Concentration on the task at hand minimizes accidents to the child or damage to the object being constructed.

The teacher keeps notes of children's needs for materials and tools, of problems to be solved or brought up for discussion, of needs for organizational changes, of ideas which should be developed or concepts which should be clarified. The teacher's observation includes the following:

Which children are solving their problems by themselves
Which children are getting needed help from other children and how they are being helped
Which children are working or are not working well with others
Whether or not safety measures are being observed
Which children are or are not working on the jobs for which they have assumed responsibility
How well the children are respecting the rights of others to tools, materials, and space
Whether or not the children seem to be interested and happy as they work

Teachers use different methods of concluding the work period. Some give a warning signal a few minutes before the end of the period so that children will have time to bring their work to a satisfactory close. Some go from group to group and tell the children it is time to put materials away and to clean up their work areas. Some signal with a bell or other soft-toned instrument; others flick the room lights on and off. Some teachers delegate these tasks to children they select.

Clean-up time presents opportunity for children to build attitudes of responsibility regarding the organization, care, and conservation of tools and materials. It is, nevertheless, given the minimum amount of time for accomplishment. Through careful, thoughtful, and thorough organization, tools, materials, and objects under construction can be placed in the proper storage areas without mishap and confusion.

To insure a successful clean-up activity the teacher, prior to the beginning of the work activity, considers all the tasks necessary to its accomplishment: he assigns special tasks to individuals or groups; provides special materials, such as buckets, pans, solvents, and rags needed for particular tasks; helps children to decide upon the traffic direction to be followed in returning or putting away their work, tools, materials of construction, and cleaning materials; and helps the children establish what they will do if they finish their tasks before the rest of the group finishes theirs.

Some teachers have the children put away the tools and materials with which they have been working before they congregate to discuss their work; others prefer to leave all clean-up activities until the work has been evaluated. Some have the clean-up at the close of the work period and hold evaluation during the pre-work period or the follow-up lesson. It is well to have all children clean their own work areas before they attempt to help their neighbors. Responsibility for a few specific jobs, such as putting away sawhorses, sweeping, and dusting may be assumed by a few children.

Evaluation During Work and After Work Periods

Evaluation is an important part of the program carried on during the work period; it is in continuous operation from the beginning of the work period until the next activity is started.

Evaluation begins with the child at his work when he measures, cuts, and assembles his materials. It is emphasized more as the teacher contacts the child while helping him to overcome specific difficulties. It even occurs with the child in the selection of the tool or utensil to use for a specific task.

In the early part of the primary years much evaluation is done "on the spot" with individuals or small groups of children. As the children mature and are able to think together in large groups, they are called together to discuss what they have done and to clarify concepts.

Children are encouraged to share their work or present it for group evaluation in the following instances:

When they need help from the group
When the teacher feels they need encouragement or praise
When there is evidence of good thinking in working out problems
When the children believe they have completed a job

During evaluation time, the teacher directs the group's attention to some part of the work which has been well done or to find what the next step of construction is to be. In the discussion of the work the children come to observe that which has been done well and to find out how this was achieved so successfully. This results in the child's peers re-examining their own work to see if there is some way in which it might be made better or to see why they, too, have succeeded in doing something really well.

The notes which the teacher took as the children worked help him to guide the evaluation to a discussion of major problems. Although all children are given opportunity to bring individual problems to the group, they are guided to see their problems in relation to those of other members. They are helped to recognize that some problems need to be considered by the whole class; others can be solved by individuals or small groups. They are helped to find ways of getting help when they need it.

The teacher assumes responsibility for helping children to clarify their ideas by injecting questions or statements as evaluation is being made. He supplies some information to help the children solve their problems, guides them to sources of pertinent information, and helps them through discussion and demonstration to learn to use tools, equipment, and materials properly. The teacher encourages the children to state their suggestions concretely and positively as they discuss their social behavior and the authenticity and quality of the work accomplished. He helps them to evaluate their work in terms of previous group planning and to modify their plans in terms of newly gained information.

The teacher knows that friendly relationships established between him and the children early in the school year do much to create and continue good attitudes. Children need to feel that their teacher is their friend and will support them. When such rapport is established, the girls and boys have confidence in their leader and are able to accept comfortably the constructive criticism which their classmates offer. With such attitudes, children derive from the evaluation period a sense of satisfaction and an eagerness to work again.

INDUSTRIAL ARTS IN THE CURRICULUM*

Industrial arts provides girls and boys with understandings of the physical environment of the world and its effects upon man's way of living. Industrial arts also helps pupils understand how man's way of living affects his environment. Such study is essential if girls and boys are to understand the foundations on which the present-day cultures of the United States and other countries have been built. If children are to live freely in today's world and if they are to contribute to an increasingly better world, they must understand and appreciate what is happening to their environment and how the past has contributed to the present. Through guided participation in industrial arts activities, girls and boys in today's schools are helped to gain desirable understandings, appreciations, and skills.

Early Industrial Processes Learned in Homes

Schools of the United States have not always needed to be concerned with industrial arts education. When tasks essential for meeting individual needs were accomplished almost entirely at home, on the farmlands surrounding the home, or within the local community, children could easily understand and appreciate the processes and social problems of the people involved.

Prior to the second half of the nineteenth century, children in the American culture participated extensively in providing for the material needs of their families. Their work included helping to harvest and conserve fruits, vegetables, and grains. They peeled the peaches and apples and stirred the jam. They cut the fruit and turned it as it dried in the sun. They gathered sap from the maple trees in winter and stirred the boiling syrup in the vats. They churned the cream to make butter and worked the whey from the curds of cottage cheese. They gathered wood for fires to smoke the meat. They watched the yeast culture multiply, saw its effects upon the rising bread dough. They watched, and helped their mothers knead the dough to an even texture. They learned from direct experience where their foods came from and the work that went into the food's preparation. They saw how people depended upon each other to provide food for the family's consumption.

Girls and boys learned about the primary source of their clothing and how nature's raw materials were changed into wearing apparel. They saw sheep raised and sheared, cotton and flax grown and harvested.

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*Reprinted in part from California State Department of Education. "Industrial Arts in the Curriculum," California Journal of Elementary Education, XXVI, No. 3 (February, 1958), pp. 138-146, 152-156.

They helped to wash the wool, to card and spin it. They saw the flax and cotton processed into thread--and sometimes participated in the processing. They collected berries, roots, bark, and plants to use for dyes, and saw the effect of the different dyes on drab materials. They knitted stockings; saw beauty woven into fabrics from which clothing was fashioned. They helped to leach the lye from ashes, to mix the lye into the fat and to stir the thickening soap with which their clothing would be washed. They helped to scrape and tan the hides from which shoes and jackets were to be made.

Even young children watched houses grow from tree to latch string and saw the men in their family and in the neightborhood work together to provide shelter for each others' families. The children dipped candles, saw furniture made, spoons molded. They plucked fowl and washed and dried the down for pillows and featherbeds.

Children watched their fathers whittle oxen yokes and trenchers, listened to the tunes played on homemade willow flutes, and tried their hands at making whistles and drums. They saw the bullets drop from iron molds, saw pouches made of tanned deerskin and powder poured from polished horns. They listened to the anvil clang in the blacksmith shop, saw horses shoed, and nails and wagon hoops hand-hammered into shape.

Through the experiences of every-day living, young people learned of man's dependence on nature and each other. They developed initiative and learned to work with other people in co-operative endeavors; learned to carry their share of the load, and to appreciate the contributions of other workers to group projects. They grew in understanding of, and appreciation for, the organizations and activities involved in making a living. It was not difficult for the girls and boys to understand that people in other parts of the world and at other times in history participated in similar activities to satisfy their physical, esthetic, and spiritual needs.

Slowly through the years the innovations of science and invention changed man's way of life. Man's dependence on the natural elements of the environment has continued; in many cases, however, methods of controlling these materials have changed. Many industrial processes, which once were done by hand in simple ways, are accomplished today by complex machines. Many raw materials, once thought to be indispensable, are gradually being replaced by synthetic sybstances made possible by chemical discoveries. Technological developments and the social changes which have accompanied them gradually have made a large percent of the people of the United States almost entirely dependent upon the efforts of other people for materials with which to meet their basic physical needs.

Opportunity of Today's Children to Learn About Industrial Processes

American children today have little opportunity in the home to develop understanding of the ways men have changed and continue to change raw materials to provide for their needs. There is little opportunity for them to have the personal satisfaction which comes from creating needed material by hand.

Although home canning, drying, and freezing are still used to preserve foods, grocery stores and bakeries provide the foods to meet most food wants. The processing of foods is generally accomplished in canneries or factories far removed from the home.

Although many women continue to sew, department and clothing stores supply the ready-made garments worn by most people. Weaving, once a preliminary step in making clothes, has now become a hobby, and one seldom hears of wool being washed, carded, or spun at home.

Houses frequently come prefabricated or spring up quickly on a production-line basis, with each worker performing a specialized task. Synthetic building materials resemble little their original sources. Interdependence continues to be necessary, but the warmth of personal contact between child-observer or child-helper and builder cannot exist. Wage scales allow no time for the carpenter to explain to the watching child the "why" and "how" of his work. Nor is opportunity provided for the child to gain understanding through active participation as a helper.

Tools, utensils, weapons, and vehicles of transportation and communication are readily available at retail stores. The child knows little or nothing of the planning and labor which have gone into their construction.

Not only does the youth of today miss taking part in processing raw materials into useful forms, he does not see the relationship of his and neighboring family members to the tasks involved in the processing. As a result, he has little opportunity to develop a true understanding of the importance of nature's raw materials to the satisfaction of his basic needs; he cannot easily understand and appreciate the problems, ingenuity, contributions, and interdependence of the people who produce and distribute the materials people need. It is likewise difficult for him to appreciate the contributions of past generations to the comforts of today's world. He cannot learn at first hand his responsibility for conserving and replenishing nature's stored goods.

Children in the Modern School Helped to Understand Industrial Processes

The school has assumed its share of responsibility for helping children to gain better understanding of, and appreciation for, the materials in their environment, for the people who do and have done the work of the world, and for the problems involved in changing the materials to more usable forms.

It is most desirable that children have available for processing raw materials such as raw foods, natural fibers from which textiles and articles of clothing are made, logs from which lumber is cut, vegetation from which synthetics are derived, and the metallic ores, clays, and other materials of the earth. At times, however, raw materials cannot be used by children and semiprocessed materials must be substituted. It may not be practical for the children to grind enough wheat or corn into flour or meal from which to make bread or piki for the group. The girls and boys may not be able to refine as much native clay as would be needed for the bowls they want to make or to render enough tallow for each person to make a candle. Young people in school cannot successfully pasteurize raw milk before they change it into cottage cheese or butter; nor can they smelt the ores from which to pound pewter or copper bowls. They cannot make baking powder, evaporate sufficient salt water to obtain salt for their cooking, or process the raw cotton into cloth from which to make sunbonnets.

The children should, however, grind enough corn to make some piki or corn bread, process enough native clay to complete a bowl, render enough tallow from which to dip or mold a few candles, process a little cotton, wool, and silk, evaporate a little salt water. By so doing they gain understanding of the basic principles of the process, and so may be guided to use with understanding and appreciation the commercial products needed for quantity production of objects and materials.

Occasionally it is necessary for children to use substitutes for authent materials. For instance, if grasses and stalks such as those used by the Hopi Indian cannot be procured, commercially prepared reeds and raffia may be used. The children make their baskets in the same way that the Indians wove baskets from the materials of their native environment. They are made aware of differences between the substitutes and the original materials.

Every area of experience in the curriculum offers opportunities for children and youth to process materials as they are or have been processed by the people of the world. Every area offers teachers opportunity to guide children to appreciate the problems of the world's people as they are or hav been involved in such processing.

Industrial Arts in Primary Grades

In the primary grades the performance of the actual industrial processes is limited to those processes which were the most simple for man to evolve. Young children use the real materials and real tools in the real ways of adult workers as they process the materials.

Children engage in the following activities relating to the processing of materials. The girls and boys make soup and stew from vegetables grown in their own gardens and from produce purchased at the grocery store or market. They make simple salad dressings to serve on vegetables from their gardens. They roast and salt the peanuts they have grown, bake apples they have picked and potatoes they have dug. They boil eggs which their carefully tended hen has laid; dry raisins, grapes, figs, and peppers. They combine pasteurized milk and cream with other ingredients to make custard, ice cream, butter, cottage cheese, and junket. The children wash and wax oranges; make marmalade.

Some corn is popped; other corn is dried and ground into meal from which to make piki or corn bread. Children watch corn bread rise, see it turn brown. They note the leavening action of the homegrown yeast, and compare it with the action of soda and baking powder, which they put in their biscuit and rye-bread dough. Pemmican or rabbit stew made by the children adds zest to an Indian meal.

The girls and boys weave small rugs for their houses, make dye from the minerals and vegetation found in the local community, and dye cloth. They build miniature pueblos, hogans, and teepees from authentic raw materials; wash, card, spin, dye, and weave wool as the Indians did and do. They gather, prepare, and mix clay, fashion and decorate pottery from the clay, and bake it in the way of the Indian or other cultures.

Children in the third grade carve rabbit sticks, make a weave on Indian band and rug looms, dry and soften rabbit skins to use as drum heads. From cottonwood and sheep or rabbit skins they fashion drums. They carve and decorate kachina dolls, make rattles, rain sticks, and prayer sticks, sew dresses and kilts, and weave baskets from grasses and reeds.

Industrial Arts in the Intermediate Grades

In the intermediate grades the girls and boys process the food of the time and place they are studying. They can some fruits, and dry fruits, meats, and vegetables. They extract the salt from salt water and use it for preserving and flavoring foods. They press oil from olives; make cheese, butter, jam, succotash, hasty pudding, and hominy, and bake beans. They grow, harvest, dry, and grind corn to use in making tortillas, hoe cake, masa, and corn bread; they grind acorns for acorn mush as the early California Indians did. They plan, prepare, and eat meals such as those eaten by the people whom they are studying.

From authentic raw materials, girls and boys of the middle grades make adobe brick and tile. They build miniatures of the ranch houses and missions of early California, log cabins and other houses of colonial days, dugout homes, lean-tos, half-face camps, sod houses, Swiss chalets, Andean huts.

They braid rope from llama wool, make quipus, carve gourd dishes, pound out copper bowls, fashion pottery. They process cotton, flax, and wool, knit some of the yarns, and weave other yarns. Some of their cloth they decorate with block-print designs typical of the culture studied. From commercially processed cloth they piece quilts, braid and sew rugs, sew samplers, and make clothing patterned after that worn in the culture they are studying. They make candle wicking and dip and mold candles from tallow they have melted from the fat of beef and mutton. They extract lye from wood ashes and combine it with rendered fat to form soft soap.

From sheep or goat hides which they have tanned, children of the middle grades create parchment from which to fashion scrolls and hornbooks. On the papyrus and paper which they process they write in ink and with the pens, both made by the children. Clay and wax tablets are formed from raw materials and inscribed with authentic styluses. On hand-made vellum the girls and boys inscribe manuscripts as did the medieval monks.

The children gouge trenchers and spoons from blocks of wood, and carve trenchers, dippers, and water jugs from gourds. They construct box and tape looms, three-legged stools, cradles, and leather-thonged beds. They make powder horns and shot pouches as their forefathers did.

Industrial Arts in the Upper Grades

As preadolescents become acquainted with the cultural backgrounds of the people of America, they process many materials. They cook foods, process textiles, and make clothing peculiar to the ancestral homelands of the various peoples who comprise the population of the United States. They dress dolls in native costumes and make miniature dwellings of the cultures studied. They make some musical instruments of materials and in the same way as the people of the countries being studied. They engage in handwork similar to that done by the people of the particular culture.

The study of American agriculture in its relation to that of other countries presents opportunities for processing. Major grains are hand ground, their flours used in making breads, and these products are compared with each other and with the products of the modern baking industry. Agricultural products of the United States are preserved or cooked and eaten; well-balanced meals are planned and prepared. Foods that compose the diets of the peoples of various countries are prepared and eaten and are compared with the foods that compose the well-balanced diets of the local cultures.

The pupils remove the fibers from silkworm cocoons, reel the silk on spools, twist it into threads, and attempt to weave it. If the upper grade pupils have not processed cotton, flax, and wool in earlier grades, they do so now. They knit the yarns and sew with the threads. Batik work and block printing extend their experiences. They bind books which they have written, cure hides and tan leathers, and experiment with natural dyes. They process clay into useful and beautiful articles.

The Importance of Construction Activities

Construction activities are integral parts of the broad integrated curriculum units. Construction activities become necessary as children make articles for dramatic play or dramatization or make articles to illustrate--in diorama, timeline, or oral presentation--historical events, inventions, or industrial and social processes of importance. Frequently it is impossible for children to create the desired articles of the same materials and in the same manner in which the original was fashioned.

The products constructed are shaped and painted by children in the primary grades to assume the appearance of the objects they represent, but the children know they are not the same. Guns and transportation models made of wood and painted to look real are sturdy and adequate for purposes of dramatic play. The framework of large buildings is constructed firmly of wood. The walls of heavy wrapping paper or cardboard take on the appearance of the structure they represent as they are painted in accordance with information gained through reading.

In the intermediate and upper grades through reading the children learn how, why, and of what the original products have been made. They learn something of the people who work to create the original objects. Their deepened understandings endow the items made by the children with the character of the original for purposes of dramatic play or dramatization.

As children play with the objects they have constructed and gain information to make their play real and satisfying, they find needs for further construction. So it goes. Play gives purpose to construction and the constructed articles in turn enrich play. Because dramatic play is the most dynamic force which moves a study forward, construction plays an important role in each area of experience studied.

The very young child who has had no previous experience with tools and wood usually spends much time in pure manipulation, perhaps in pounding nails into boards with no end product in mind. He may enjoy pounding nails into and fastening bottle tops onto short pieces of soft pine which the teacher has retrieved from the waste piles of cabinet shop or planing mill. Tools suited to the child's ability add to the enjoyment and satisfaction of the process.

Later on, the child may nail two or more boards together. The product is suggestive of what the child is constructing, but is not complete or accurate. He may give his constructed object a name if it resembles some known product. He may take the object home the same day he makes it, just as he does some of his painting and clay work; or he may keep it at school to use in solitary or parallel play, or even for a transitory bit of small group play.

Before many weeks have passed the child begins to make objects to supplement those placed in the environment by the teacher. As the child is encouraged to use his constructed object in dramatic play, he finds that other people attach value to his creation. In time he may be willing to construct objects for use by other children and become willing and eager to leave the articles at school so that play will be more fun.

As the child matures, he becomes more able to plan with others to construct the items needed for satisfactory group play; he helps to construct the articles even though he may prefer to work on a different project. Still later, he works with one, two, or more classmates on a single item to which each worker contributes ideas and labor.

Models sometimes are built to illustrate a process or a socially significant historical event. Dioramas may depict events of economic and social importance; and sometimes a series of dioramas serves a time-line. Through constructing the objects, pupils are helped to organize the information they have gained. They use the constructed objects as they use other visual aids to illustrate their explanations of events or processes. In this way the objects serve as resource materials for other people. The use of models and dioramas is more prevalent in the upper than in the primary and intermediate grades.

Studies of every area of experience are enriched and extended by construction of properties for dramatic play. In the primary grades the items are usually small and give many children opportunity to play at one time. As the children play with the buildings and vehicles of their communities they learn the relatedness and interdependence of the various structures and services within the community. As they rotate jobs during dramatic play, the children begin to see, feel, and understand the importance of all persons to community life. Many social and intellectual learnings are reflected in the children's behavior as they construct and play with their products.

(more in original text)

Outcomes

Any activities undertaken in the school should produce desirable outcomes in terms of pupil growth and development. The industrial arts education promotes growth in social relationships, in understanding and knowledge, in esthetic judgement and appreciation, and in the development of motor skills.

Growth in Social Relationships. As girls and boys are helped to process materials and to construct articles by themselves and in cooperation with their peers, they grow in respect for other people's rights. They are guided to learn that they can spend a more profitable time in actual work if they participate in planning, clean-up, and evaluation periods. They are taught not to take space, tools, or materials which rightfully belong to others. They learn to ask the one using a tool or some material for permission to use the one they need. They learn that they cannot use certain materials that others need in completing work they are doing. They come to realize that they must not destroy articles being made or materials being processed by other children. They learn to be considerate of the feelings of those to whom they make suggestions for improvement of work.

Children are helped to grow in ability to choose wisely from available materials so that finished products will be as they desire them, and so that materials needed by others will not be wasted.

Habits of co-operation are strengthened as girls and boys are given many opportunities to share materials, tools, ideas, time, and space; as they are encouraged to let other people use products which they have made or to which they have contributed; and as they are permitted to use the products others have made. They gain a feeling of belonging as they work with their peers in creating needed objects. Through guided participation in many group enterprises, children learn to do their share of the work in co-operative projects and to be accurate in the work they contribute. They learn to adapt their ideas and wishes to group-conceived plans.

Children learn to assume and fulfill responsibility as they construct. The child who makes a filling station and adds it to the model of a community or completes a diorama, recognizes the importance of his contribution toward completing a task. As he continually checks his opinion against facts in order to be successful in his activity, he realizes more fully the importance of verifying data and basing his work on valid information.

Children grow in self-esteem as the products of their efforts are accepted and used by their peers. They grow in ability to take suggestions and criticism cheerfully and thoughtfully as they achieve success and gain satisfaction from work well done.

Children grow in independence and self-confidence as they achieve success. At the same time, they are helped to recognize with increasing vision their dependence on others and the dependence of all people on nature and on one another. They improve in understanding of the simple relationships of co-operative living.

Growth in Understanding and Knowledge. As girls and boys constantly meet and are helped to solve individual and group problems of varying degrees of difficulty and complexity, their understandings are clarified, deepened, and broadened. They learn about the kinds and sources of materials used, the unique potential of each material, and why certain raw materials are chosen for making particular products. They learn the principles governing the processes by which materials are changed to more usable forms and the use to which the finished products are put. They learn of people's dependence upon each other and upon the physical resources of their environment. They become aware of the working conditions of the people who produce various goods. They learn something of the problems of management and labor, supply and demand, and of the laws established to insure fair treatment for employer, employee, and consumer. They see how the products of modern industries promote men's physical and mental health. They learn of the need to provide for the wise use of the increased leisure which has resulted from modern industrial development.

Children may become sufficiently interested in a process to continue it as a hobby or ultimately as a career. They may develop a continuing interest in the changes and progress of industry and read with understanding newspaper and magazine articles and industries. They should become increasingly more skillful purchasers and appreciative consumers of the goods of industry. The extent of knowledge and understanding developed in the field of industrial arts varies with the maturity and experience of the children involved. An illustration of each development follows.

A group of children had been vitally interested in managing and publishing a school newspaper. Their interest in the development of the paper led them to do research about the discovery of paper and the early history of its manufacture. The group read about preparation of papyrus by the ancient Egyptians. Many books, maps, films, and other audio-visual materials were used to find accurate information.

The entire group of 35 girls and boys worked together to cut, pound, and dry the papyrus. They worked hard and with genuine interest. They wrote hieroglyphics upon the surface and expressed an appreciation for the untiring efforts of the contribution of the Egyptians to paper manufacturing. They compared the processing and use of papyrus to modern methods of making paper. They felt that this rich experience had given them not only an understanding of the processes used by the ancient Egyptians, but also an understanding of how modern methods have facilitated the production of newsprint and other kinds of paper.

The research which accompanies construction of objects contributes to intellectual growth. As children engage in research which will help them to build airplanes, construct verandas, and design Inca jewelry to use in dramatic play, and as they make these items, they develop an increasingly deeper understanding of the people about whom they are studying. Working out sound effects for their radio script, making a telegraph key, weaving on a box loom, or building a model of Boonesboro demand the gathering of information which may clarify meanings and understandings. Through experimentation with ships which they have hollowed out of blocks of wood they learn something about buoyancy and balance.

Growth in Esthetic Judgment and Appreciation. Through industrial arts, girls and boys become aware of the potentialities inherent in each type of material with which they work. They learn the possibilities of working with clay, how it can be molded, shaped, carved, and welded, or thinned to "slip" consistency to pour into a mold. They learn that it hardens, can be glazed, fired, and changed into permanent form. They learn that wood can be cut, carved, polished, glued, and nailed.

They become acquainted with the qualities of various metals. They discover that pewter can be readily molded by hammering, that copper is more difficult than pewter to shape, and that tin is easy to cut and solder.

Through guided experiments, they find that textiles can be bleached, dyed, painted, woven, braided, or knitted, crocheted, embroidered, cut, and sewed. They learn that each time a change is made in the form of a material, that the material becomes more or less beautiful.

As children grow in the understanding of the materials with which they work, they are encouraged to develop ingenuity in their use of the materials. They explore and discover new ways of working. They begin to create new designs. As they are guided in experimenting with materials and in examining the products of other people's endeavors, they learn that even industrial products of a utilitarian nature may be made pleasing in design, texture, color, or a combination of these qualities. Through these experiences they may learn to be discriminating in the choices they make.

Growth in Motor Skill. Children develop motor skill as they use the tools in processing and construction. The concreteness of the product and the satisfaction gained from its use encourage the children to work carefully. Eye-hand co-ordination is improved as children draw plans, cut along lines, pound nails accurately. Tools and materials are provided and guidance is given in terms of the developing physical skill of the children.

Many children, who are less successful than others in verbal expression, may find that they can express themselves effectively through concrete materials and so come to improve their self-concept. Certain children who excel in academic learning learn to have genuine respect for children who have greater competence than they in handling tools and producing objects of satisfying quality. All types of abilities are needed in the complex world in which children are in the process of finding their way, and the school which serves them well is one which values the unique potentialities of each individual and provides opportunity for their nurture.

Learning That Takes Place Is Real Measure of Activity

In all industrial arts activities, the real measure of the value of the experience is in the learning that takes place. True, the product resulting from the activity has satisfaction for the child, but the activity involves the real learnings which come about through problem-solving, enjoying the work with others, and the joys of production. The child has to examine and to select materials appropriate to the construction, and the tools necessary; to plan placement and sizes of doors, windows, and facilities to serve the pipe-cleaner figures or child occupants. He builds the structure in accordance with his personal preferences and in relation to his awareness of the ways of the culture in which he lives. He must do the work and overcome the difficulties as they occur in order for the end product to be useful and satisfying to him. He thereby identifies himself as a worker in the world and arouses in himself a sympathetic understanding and appreciation of all those persons upon whom he depends for the worth-while things of life.

REFERENCE OUTLINE FOR A PRODUCTION UNIT IN THE ELEMENTARY GRADES*

Some expected outcomes from the production unit may be:

1. A high degree of interest shown by the students.
2. The desire of the class to cooperate and to work together.
3. A striving to be inventive and to come forth with new and good ideas.
4. An effort on the part of each individual to attain a higher quality of workmanship.
5. The ability of some to become leaders and to practice the principles of good human relations.
6. An understanding of and participation in all the facets of organizing and operating a manufacturing business.

A suggested outline to follow in planning the unit is as follows:

I. MANUFACTURING

Objectives

1. To review the history of manufacturing.
2. To learn the important part manufacturing plays in our economic freedom.
    - A. Early manufacturing
    - B. The manufacturing era
    - C. Growth and specialization of industry
    - D. Small and large business

        Some of the qualifications the beginning manufacturer must have are:

        1. A reasonable amount of capital
        2. A considerable amount of ingenuity
        3. The ability to create and manufacture a good product
        4. A thorough understanding of the product
        5. The establishment of the right kind of shop to produce the product, that is:
            - a. Jobbing shop - one which contracts work made to order.
            - b. General manufacturing shop - one which makes a wide variety of things, usually short runs.
            - c. Specialized manufacturing or production shop - one which makes one item or one line of merchandise.
            - d. Part-time shop - one which provides spare-time work for a skilled person, such as repair work and custom-made items.
        6. A knowledge of the market for the product.

        Big business too has many operating problems. Among these are:

        1. Need of increased capital for expansion
        2. Increase in overhead and operating costs
        3. Maintaining the quality of the product
        4. Securing adequate and skilled labor
        5. Maintaining proper supervision
        6. Building an adequate market or outlet for the product

*Outline developed from Haws, Robert W.., and Schaefer, Carl J. Manufacturing in the School Shop. Chicago: American Technical Society, 1960.

E. The American way

II. WHAT TO MAKE

Objectives

1. To learn how ideas grow.
2. To determine what projects could be manufactured in the school shop.
    - A. How ideas grow.
    - B. Where to get ideas.
    - C. Be original.
    - D. Make it useful.

      In thinking about a project to make in the school room, one must keep in mind certain general limitations such as:

        1. Are the members of the class interested in the project?
        2. Does the project serve some useful purpose?
        3. Can it be made with available equipment and tools?
        4. Are there any parts that cannot be so made?
        5. Can these parts be purchased?
        6. Does it lend itself to mass production methods?
        7. Is the project saleable locally? Nationally?
        8. Does it infringe on an existing patent?

III. HOW TO MAKE IT

Objectives

1. To learn how to analyze a job or project intelligently.
2. To study the problem of how best to produce the project of your choice.
    - A. Steps in research
    - B. Job breakdown
    - C. Operations breakdown

IV. PRODUCTION METHODS

Objectives

1. To stimulate thinking about the designing of tools to accomplish multiple production.
2. To learn the advantages of using production methods when producing large numbers of articles or parts.
    - A. What are production methods?
    - B. Tooling-up
    - C. The tool designer
    - D. Jigs and fixtures
    - E. Specialization and concentration
    - F. Aids to material handling.

V. PLANT LAYOUT

Objectives

1. To learn the need for, and advantages of, efficient plant layout.
2. To study a means of determining what tools and equipment are needed for production.
3. To find the best possible plant layout for the manufacture of a product.

- A. Suitable equipment for production
- B. Production line
- C. Flow of materials
- D. Assembly lines
- E. Finishing
- F. Inspection
- G. Packing

VI. PERSONNEL

Objectives

1. To learn how the personnel of a manufacturing concern is organized for efficient production.
2. To learn the importance of being a dependable worker.
3. To study the qualification of a supervisor or foreman.
    - A. Organization and management
    - B. How it operates
    - C. Choosing the right personnel
    - D. Duties of personnel
    - E. Work incentives

VII. THE BUSINESS END

Objectives

1. To study the important cost elements of raw materials, labor and overhead.
2. To appreciate the American free-enterprise from both manufacturers' and retailers' viewpoints.
    - A. How to arrive at price
    - B. Profit
    - C. The retail price
    - D. Bookkeeping
    - E. Distribution

Turning Out Make-Believe Cars Teaches Real Economics

Assembly-line production of MR-24s hits snags typical of any factory — but sound business procedures untangle the mess in this fifth grade

By Gene E. Rooze
Fifth Grade Teacher, Buffalo Grove, Ill.

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AN ANXIOUS fifth-grader rushed up and said: "Mr. Rooze, this just won't work! Robert's production line can't keep up. We've got to shift some labor into the Top Assembly Division." And this is exactly what the Model MR-24 Automobile Company decided to do at its next production meeting.

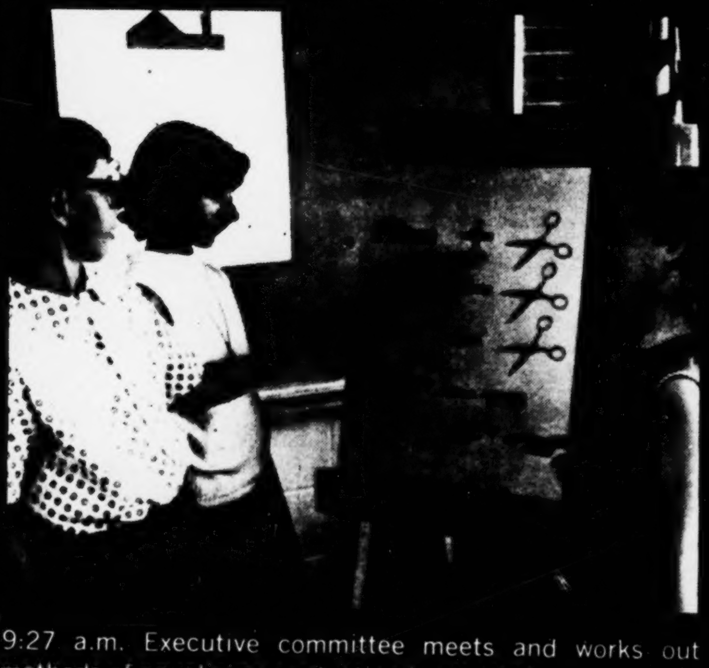
It all started as an activity in the study of the topic "The Manufacturer—Automation and Trade." I was developing the concept of Management, along with the subconcepts: Division of labor, Standardization, Techniques, Production, and Cost. The idea was to aid the children in generalizing that:

1. Division of labor allows man to produce more of the things he wants and needs.
2. Standardization of parts requires accurate systems of measure.
3. Man can vary the factors of production—land, labor, capital, and management—according to his needs.
4. The goal of the manufacturer is to produce the most at the least possible cost.

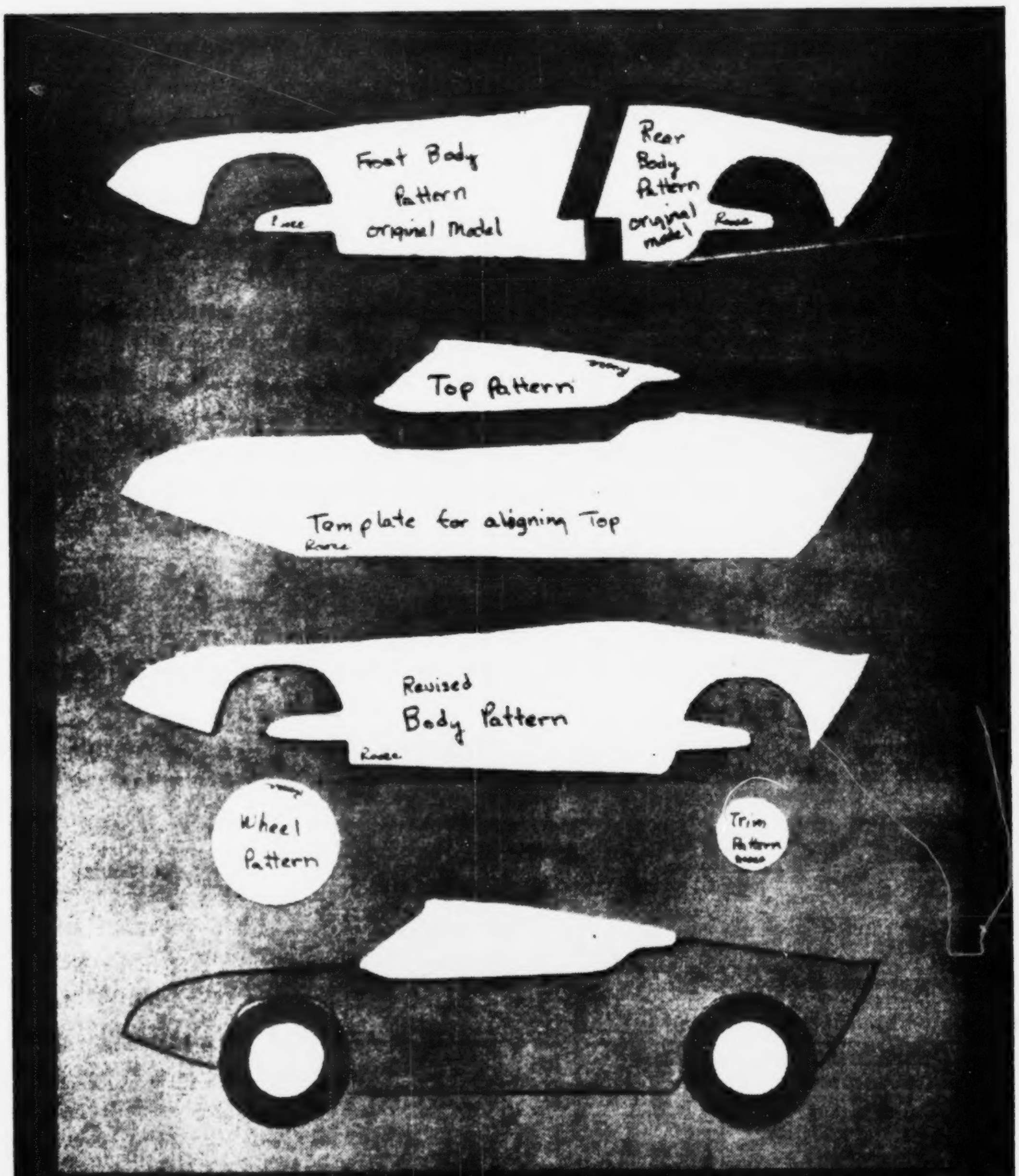
We had started the unit by having

9:00 a.m. Workers are in full production at MR-24 car plant, funneling parts to the assembly line.

9:16 a.m. Shenanigans in the Top Plant cut output and threaten to cause shut down of the line.



9:27 a.m. Executive committee meets and works out methods of equalizing production in all plants.



Patterns used for mass production in the MR-24 factory show improvements experience brought. First was a template to automate positioning of top. Second was unitizing the body.

SUB-ASSEMBLY DIVISIONS

DIVISIONS	Labor			Capital	
	Tracers	Cutters	Scissors	Pencils	Pattern
Top Assembly	1	1	1	1	1
Front Body	1	2	2	1	1
Rear Body	1	2	2	1	1
Wheel Assembly	1	2	2	1	1
Trim	1	2	2	1	1
Totals	5	9	9	5	5

TRANSPORTATION DIVISION

Division	Type of Labor	Capital
	Carriers	Boxes
Transportation	2	2

FINAL ASSEMBLY DIVISION

Station	Type of Labor				Capital	
	Tracers	Assemblers	Special	Scissors	Pencils	Paste
Brace			1	1		
Body		1				1
Top	1	1			1	1
Wheel		1				1
Trim		1				1
Totals	1	4	1	1	1	4

PRODUCTION RESULTS

Production Method	Minutes Worked	Number of People	Units Produced	Cost per Car
Individual Production	40	22	18	49 units
Mass Production				
Day #1	30	22	16	41 units
Day #2	30	22	34	18 units

each child make a complete auto. This took a great amount of time. By the end of the 45-minute period, 22 children had produced only 18 cars. In a class discussion, the children concluded that, if we were to attempt to sell these cars, some would not be marketable. Many of the styles created were too "far out" for general appeal.

I asked the class: "How can we do a better and faster job?" They came up with these answers:

"Nancy can do a better job of designing the car."

"Susan and Michael are good tracers. They can draw around the patterns that Nancy makes."

"Donald and Carol can cut better than Weldon and George."

Since Larry and Andrea didn't want to do any of these jobs, it was decided that they would help us by carrying parts from place to place. They would furnish the transportation between the different work areas.

When the children were asked what we had done, the answer came quickly: "We've divided up the work." It was a simple step then to the sub-concept of *Division of Labor*.

Since the children had already seen the Encyclopaedia Britannica film *Eli Whitney*, the concept of standardization was not new to them, but it needed development. Our patterns, modeled after the Ford GT, would allow us to make our parts the same size and shape.

The remaining problem was one of planning. How could we organize a class of 22 children so that we could do the best and fastest job? We were going to have to plan our layout so things would run smoothly. Each job was to be as simple as possible. We were planning our *Techniques of Production*.

The class decided we would need six separate factories: The Top Assembly Division, the Front Body Division, the Rear Body Division, the Wheel Division, the Trim Division, and the Final Assembly Division. A separate division for transportation also had to be established.

Labor and capital were allocated according to the accompanying

Turn to "Economics," page 167

ECONOMICS *from page 93*

charts. The subassembly divisions would need a total of five tracers and nine cutters. The capital equipment would consist of nine scissors five pencils, and five patterns.

The Final Assembly Division needed to be organized with one tracer and four assemblers. The brace maker wanted a special title. Four paste pads, one pencil, and a pair of scissors were needed as equipment. Groups were arranged in production-line fashion, and production began. We soon learned we had problems:

The Top Assembly Division could not keep up. Their product was unsatisfactory. They had to slow their production. This prevented them from meeting their schedule.

The body divisions had the most problems. At first, production along the individual lines went very well. But we soon discovered that the separate parts did not fit together at the Final Assembly Division. This stopped production in three factories.

Our production was stopped because our *System of Measure* was not precise enough. The tracers were not following the patterns that had been planned.

After we corrected these problems, production continued for the assigned 30 minutes. We produced 18 cars. At this point, the factories had a division meeting to plan the second day of production.

I asked the children to discuss the problems they had encountered in their separate groups. They were to look for solutions to the problems. New methods of production were to be considered, too. Solutions and recommendations were to be included in their report. These reports were to be presented to a meeting of all division managers.

The recommendations from that meeting were:

1. Increase labor in the Top Assembly Division.
2. Decrease labor in the Wheel and Trim Divisions.
3. An innovation was introduced —the auto bodies were to be unitized instead of made in two halves.

Labor problems were avoided by transferring the displaced workers into other positions. We added one tracer and cutter to the Top Assembly Division, revised the operation of two of our factories so that they produced the same product, and decreased the amount of labor in the Wheel and Trim Divisions. Production was stopped at those factories for 10 minutes until their products were used up.

Production ran very smoothly the second day. We produced 34 cars in our 30-minute period. When we summarized our production, we talked about cost. It was done very simply. We counted only our labor, but the children were quick to point out that a real manufacturer would have included many things that we could not include. Raw materials and profit were discussed as possible examples of these things. Finding a way to figure just a simple cost was difficult. I helped the group develop the formulas:

Number of workers × minutes worked = man-minutes worked

Man-minutes worked ÷ cars produced = cost per car

Since we had studied both multiplication and division, many of the children were prepared to do this work. As the table on page 93 indicates, the cost of the cars decreased drastically the second day of mass production. Note that the cost of production does not include the cost of preparing for production, tooling-up, etc. This was done intentionally by the teacher, but I don't think I would omit it again.

Our goal had been to produce the greatest number of cars at the least *cost* to us. By the use of the *techniques* of *standardization* and by *dividing the labor* and using the most skillful people in the jobs that required their skill, we were able to increase our *production*. ■■

EDUCATIONAL EXHIBITS AND DISPLAYS*

Elementary School Uses: Parents' nights, hobby shows, annual exhibits, culminating activities of units, classroom display cases, school display cases, business - education day - store windows.

This is something you will be expected to do - perhaps first week.

Definition:

Display differs from exhibit. Display derives its most widely accepted meaning from commercial application. It may mean magazine layouts, posters, painted signs, and arrangements of merchandise in window displays. Displays are usually concerned with two-dimensional objects.

Exhibits have an educative or informational purpose rather than a commercial one. An exhibit may include two-dimensional items such as posters, charts, graphs, and pictures - however, its essential element is a visual impression created in large measure by three-dimensional rather than by flat material.

An exhibit is an arrangement of realistic materials, primarily three-dimensional which is designed to inform the observer about a subject of educational significance.

PLANNING AND PREPARING A SCHOOL EXHIBIT

I. Establish your purpose. Put down your purpose in writing. Is it to stimulate interest in science, health habits, safety, conservation or fire prevention? Is it part of the culminating activity for a unit of study? Is it intended to show a process such as paper making, weaving, candle making, etc.? Is to to convey an impression of culture in other lands - Mexican, Japanese, England? Is it to commemorate a special event or day such as Girl Scout Week, Thanksgiving, Christmas, Washington's Birthday, or Easter?

Decide what you wish to accomplish with the exhibit. This is done only with a maximum of clear thinking and planning. If you cannot state your purpose clearly and concisely, you probably do not have one.

II. Make a plan. Work it out on paper, showing measurements, design to be followed, color scheme, lettering, and placing of materials. Planning is the key to a good exhibit. Pupils should help. Children who help with an exhibit will gain more than those who later simple see and enjoy it. It should be planned in keeping with good and sound educational principles.

*Developed by the Department of Industrial Education, Eastern Michigan University, Ypsilanti, Michigan, 1966.

1. Measure the space to be used and fit your exhibit to this space.

2. Consider the different exhibit types and decide on the one to be used.
   a. Contrast and Comparison. Contrasts are valuable in making children aware of a situation and wish to correct it. Mr. Careful Walker and Mr. Careless Walker. Mrs. Everwell consults Dr. Quack. Conservation and fire prevention shows (1) burned-over area and natural green area. Interior of pioneer home and interior of modern home. Johnny Sick surrounded with foods representing poor diet and Johnny Well surrounded with foods representing a balanced diet.
   b. Related series or related steps in a process. Series of panels showing steps in making a globe. Steps in setting a table, Pioneers making candles, soap, or shearing, washing, dyeing, carding, spinning, and weaving wool.
   c. Concealed Exhibit. Main feature is hidden away to make viewer go out of way to see it. Box with back to front of exhibit... "Most dangerous insect in the world." Viewer must go to the rear of the exhibit to see flies in cake or in kitchen. Wall of boards with knot holes labeled, "Don't look," or "Here's another." Back of each hole are placed well-lighted small box exhibits.
   d. Miniatures and Enlargements. Use actual or life-size when possible. Miniature models can show interior of a mine, natural habitat of animals (nature study), early saw-mill, blacksmith shop, oil refinery, assembly line, locks at Sault St. Marie, Plymouth Plantation. Enlargements are used to attract attention or bring out details; exaggeration here is the key to attention.

3. Make it simple. Your exhibit should carry one central idea. If you have too much for one exhibit, make another.

4. Consider color. Color is an important factor in any display or exhibit. Use it to attract attention, to show classifications and groups, for background, and for lettering.

Use a color wheel. Colors directly opposite are complementary. They are contrasts but work well together.

Any three colors equidistant on a wheel provide a pleasing three-color combination, (Triads).

Some colors present specific occasions or ideas - White represents purity, yellow - sunlight, orange and black - Halloween, yellow and violet for Easter, red and green for Christmas - familiar association.

Reds, yellows and oranges are cheerful, warm, conspicuous. Associated with fire, excitements, danger. The cool colors - blue, green and purple are restful and soothing - represent water, sky, grass.

5. Use lettering for explanation and description. Make by hand with speed ball or felt pen. Cut out plywood, styrofoam, cardboard, or felt letters three-dimensional letters are effective attention getters.

Gummed letters may be purchased.

Use color in lettering - dark blue on white, black on yellow, green on white, black on white, for effective reading at a distance.

6. Consider lighting. It serves to focus attention and to bring out effects created with design and color. Artificial light is usually better than day light. Use simple spot light or flood light. Use colored plastic over fluorescent tube - they will not burn. Dip ordinary bulbs in poster paint.

7. Use motion devices as "attention getters." Rotary or oscillating.

III. Carry out your plans. Make your three-dimensional object. Pupils should help. Make the signs and posters. Be ready to make changes if final arranging seems to demand it.

Some additonal principles to consider.

1. Make planning, construction, and setting-up of exhibit a co-operative project with your students. Much of its educational effectiveness will otherwise be lost.

2. Consider the type of viewer or audience to be reached. It makes a difference. Make heat motor-funnel and 100 W. bulb-umbrella shaped fan.

3. Use movement. Turntable (record-player), concealed electric fan will stir paper hangings, or move a turn-table. Use flashing lights. (Christmas lights) Motion makes can be purchased. Manikins on soft coil spring may be moved with electric fan.

4. Cartoons are effective because they appeal to the sense of humor.

5. Explanatory posters should be brief and be read in one or two minutes.

6. Divide construction into small, definite assignments; lettering, preparing models, mechanical equipment, painting.

7. Plan background well - like setting stage for a play.

8. Present most information at eye level, if possible.

9. Keep objects to scale to avoid giving distorted size concepts.

Some Definitions: (Three-dimensional materials for exhibits)

Models are recognizeable reproductions or representations of the things. May have removeable parts.

Cut-away models provide interior view of objects which cannot ordinarily be observed.

Objects are the actual thing.

Specimens are objects or parts of objects that are typical of a class of objects. Pressed flower, skeleton, tuffed bird.

Mock-ups are similar to models but are distinguished by re-arrangement and condensation of essential elements so they can be studied readily. Two-cycle engine, mechanical crane, locks.

Diorama is a three-dimensional scene, having a center of interest, and involving blended foreground and background. Perspective is used.

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CONSTRUCTION*

1. What is construction?
    a. Construction is a means of fulfilling natural needs that arise in the total development of growing children.
    b. Construction puts the children's ideas into concrete form.

2. What should children construct?
    a. Children should construct those things which are needed to clarify concepts in social studies, to enrich problem solving, and to provide settings for dramatizing stories or dramatic play.
    b. The construction may be large (a post office) or small (a truck).

3. What are the values of construction?
    a. Construction provides colorful backgrounds and objects to enrich social studies.
    b. Construction gives opportunity for kinesthetic satisfaction.
    c. Construction allows for cooperative practice.
    d. Construction gives opportunity for making worthy contributions, thereby helping the child to gain status with the group.
    e. Construction develops group-mindedness.
    f. Construction provides for experimentation (problem solving).
    g. Construction provides for manipulation.
    h. Construction gives opportunity to teach the proper use of tools (safety laws).
    i. Construction involves initiative and responsible thinking.
    j. Construction utilizes experiences.
    k. Construction increases the use of social standards.
    l. Construction gives the children a feeling of satisfaction resulting from individual accomplishment.

4. What is the procedure for a construction lesson?
    a. The children talk over the need for the construction.
    b. They decide on the standards required when they work in committees.
    c. Committees are named, and the class plans for committee work are made as follows:
        (1) The tools needed, where they are kept, and how to obtain and return them.
        (2) The safe use of tools
        (3) The materials needed, where they are kept, and how to obtain and return them.
        (4) Thrift in the use of materials.
        (5) What each committee is to do.
        (6) The warning signal.
        (7) Standards for the clean-up.
    d. The class breaks up into committees and gets to work.
    (More in original text)

*Reprinted in part from Nelson, Leslie and McDonald, Blanche. Guide to Student Teaching, Dubuque, Iowa: Wm. C. Brown Company Publishers, 1958, pp. 136-7.

RELIEF MAPS*

Basic Materials:

- 1/2" celotex
- screen molding 5/8"
- thin cardboard for contours
- paper carton cardboard for map outline
- 1" brads
- glue
- tempera paints
- shellac

Procedure:

1. Enlarge map to desired size (cross-sections, pantograph, opaque projector)
2. Trace map outline on carton cardboard and cut out. (shears, tinners' snips, or jig saw)
3. Cut celotex to size for base.
4. Fasten cardboard outline to rough side of celotex. (glue, staples, or small brads)
5. Cut contours for plateaus, mountains, etc. from thin cardboard and attach to map outline with glue and staples.
6. Cut and attach molding to celotex base. Use mitre joints and fasten with glue and brads.
7. Prepare terrain filler and apply to surface of map (see formulas below)
8. Paint map area appropriate altitude colors. (see conventional relief map for accepted coloring)
9. Apply thin wash of white shellac to entire surface.
10. Place any desired lettering, directional arrows, etc., on small pieces of paper and glue to map.
11. Apply one or two coats of white shellac to entire surface.
12. Attach wall hangers to back, if desired.

Common Fillers for Relief Maps:

Foam Rubber relief maps are easily made by elementary pupils after a demonstration by the teacher. Use 3/8" to 1/2" thick foam rubber. Trace map outline on rubber and cut out with shears or tinsnips. Contour areas may be built up by successive layers of thin (1/8" foam rubber. Cut to show elevation by holding the scissors at an angle sixty degrees to the left or right and adding these contour pieces successively until the desired elevations are reached. The foam rubber is glued with rubber cement or white glue to the background. Insulation board (celotex) is the least expensive and quite desirable because of its light weight. Remember to shear down lowland areas and build up elevations before gluing to the background. Although water colors are commonly used to add relief colors to foam rubber maps, felt tip pens give these a very unusual effect: a vividness which makes a very attractive map.

*Developed by the Department of Industrial Education, Eastern Michigan University, Ypsilanti, Michigan, 1967. The "Soap Making," p. 163; "Suggested Minimum Tools," p. 164; "Suggested Woodworking Experiences," p. 165; and the "Study Guide: Industrial Arts for Grades K-6," p. 168, were also developed by the Department, 1967.

Papier Mache' is a thrifty filler material with which children enjoy working. Shred old newspaper or facial tissue and add wheat past and enough water to make the mache' the consistency of clay. Avoid using any more water than necessary. Paint with water colors, tempera, or oil paints when dry. Papier mache' may be used on any background material and will adhere without the use of a mat (cutout landform), but the material must be framed before the papier mache' is applied or you will have a warped map. Insulation board may warp even when framed if you have too much water in the papier mache'.

A cup of powdered asbestos added to papier mache' will result in a map with a much harder surface. This material molds much easier than the original papier mache' and thus children find they can work faster with better results. Shellac the dry surface before painting with enamels. This material is sold commercially by American Handicrafts of Detroit under the label Shreddi-Mix.

Sawdust Compound. Children who are patient will really enjoy working with sawdust compound. Sift four cups of fine sawdust, add one cup of dry wheat past, and one-fourth cup of plaster of paris. Mix well by shaking in a paper sack. Pour into a bowl or large can and add water gradually until the mixture feels like clay that is ready to mold. (This material may be stored two or three days in a closed container in a cool spot.) As this material is especially sticky to the user's hands, children may tire of using it more easily than other materials. They will have to wash and wipe the hands often while molding this material into a map. (This is a versatile mixture which can be used to mold ash trays, candle holders, candy dishes, etc.) This material can also be used to make elevated continents on papier mache' globes.

Wall Compound. Easiest to mold of the more permanent materials which make excellent fillers for relief maps is wall compound. This material, when mixed to the consistency of soft clay, molds easily and the worker has plenty of time in which to work. Wall compound, also known as joint cement, can be purchased at your nearest lumber yard. It can be covered and kept several days as a wet mix. The finished product will need one to three days in which to dry. Cracks may appear as it dries. In such cases, mix a creamy consistency and fill the openings.

Water colors, rubber base paints, or enamels work fine on this material. Rough spots may be sanded with fine sandpaper. As the map dries, even as the pupil works with the filler, a fan may be placed near to speed the evaporation of the moisture in the filler. This material is excellent for use in the making of globes and models of any nature where you have time to let it dry. It dries with a smoother surface, sculptures more readily than most fillers, and does not break easily when dropped. Remember not to pour excess materials down the drain.

Plaster of Paris is an excellent filler for the fast worker. It does not adhere as securely to smooth surfaces as does wall compound. When using it as a filler it is desirable to "rough" the surface or punch holes in the base and mat of the map. Hardboard should be placed rough side up. This material can be carved and sanded. Paint relief colors with rubber base paints, tempera or enamels after it has "cured" for three or four days.

Spackling Compound is a desirable filler because it does not set up as rapidly as plaster of paris. It molds more easily.....like liquid plastic. The dry surface is more plastic-like than plaster of paris. The cost of the two materials is approximately the same and, like wall compound it may be obtained at the local lumber yard. Paint with tempera and then shellac or use rubber base paints or enamels.

Suggestions and specifications:

Include hills or mountains.

Include rivers and lakes; rivers should be indented in filler.

Special textures may be obtained by using such materials as fine sawdust, sand, coffee grounds, filings, etc.

High mountain peaks may be accurately gauged by pushing sharpened sticks into cardboard and building around them with filler.

SOAP MAKING

Basic Materials:

Can of lye-13 ounce
5 1/2 lbs clear grease
3 pts cold water
iron or enamel kettle
metal mold or wood box
cheesecloth
wooden spoon or stick

Procedure:

1. Slowly empty contents of can of lye into 3 pints of cold water in iron or enamel utensil (use only iron or enamel). Stir occasionally until dissolved. Allow to cool.
2. Boil waste kitchen grease in double its volume of water to free from salt. Be careful not to overheat the fat as this will cause it to turn dark. If you desire a very white soap, cook a raw peeled white potato with the fat. Skim off 5 1/2 pounds of clear grease. Clarify by straining through cheese cloth. Allow to cool but not solidly.
3. Pour luke warm lye solution slowly into lukewarm grease, stirring thoroughly. Cook soap under a medium temperature while continuing to stir for 15 minutes.
4. Pour into metal mold or wooden box.
5. When it is cool and set, it may be marked off into cakes.
6. Keep in a warm place for two days, then cut into cakes.

Suggestions:

1. Only the teacher should handle lye and demonstrate the making of soap to the children.
2. Safety requires that children should be allowed to stand or sit no closer than two yards away from the demonstration.
3. Use flake commercial lye. It is dust free.
4. Teach children the poison sign and the antidotes on the lye can.
5. Lubricate hands with cold cream before and after demonstration.
6. This activity can be either correlated or integrated to advantage with studies in science or manufacturing.
7. Fits well with work in an historical unit dealing with colonial or pioneer life.
8. It is useful as a medium for carving figures for dioramas, panoramas, and/or maps.

Selected References:

Integrated Handwork for Elementary Schools, by Louis V. Newkirk.
B. T. Babbitts, Inc.: New York, N. Y.
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SUGGESTED MINIMUM TOOLS

School and Home Industrial Arts

Industrial Arts in the school or at home requires an adequate but not expensive outlay of tools. A typical and servicable assortment is listed below. The tools are grouped according to their principal use.

Tools to Get Out Rough Stock

		Used to:
1.	Rule	Measure thickness, width, and length
2.	Pencil compass	Draw circles
3.	Dividers	Measure spaces
4.	Hack saw	Cut metal to length
5.	Try square	Test for squareness
6.	Rip saw	Saw wood to width-cuts with the grain
7.	Marking gauge	Measure and mark equal depth, width, length
8.	Crosscut saw	Saw wood to length-cuts across the grain
9.	T-Bevel	Draw angles
10.	Tin snips	Cut sheet metal

Tools to Work Stock to Size

		Used to:
1.	Hand scraper	Scrape surface of wood
2.	Jack plane	Smooth wood surfaces-side grain
3.	Coping saw	Saw irregular curves from thin wood
4.	Sloyd knife	Whittle and carve wood
5.	Wood chisel	Cut and carve wood
6.	Wood file	Smooth wood surfaces
7.	Back saw	Cut small pieces of wood makes straight cut
8.	Block plane	Smooth wood surfaces-end grain
9.	Mill file	File metal
10.	Mitre box and saw	Saw angles

Tools to Fasten Parts Together

		Used to:
1.	Ratchet brace	Hold auger bit
2.	Hand screw	Hold wood
3.	Screw driver	Drive (twist) wood screws
4.	Cutting pliers	Cut wire and general purpose
5.	C clamp	Hold wood, metal, etc.
6.	Ball-pein hammer	Bend metal and general purpose
7.	Auger bit	Bore holes in wood
8.	Nail set	Drive nail heads below surface of wood
9.	Hand drill	Hold twist drill - straight shank
10.	Combination pliers	Bend wire and general purpose
11.	Claw hammer	Drive and pull nails
12.	Countersink bit	Shape holes in wood for flat head wood screws
13.	Twist drill	Drill holes in metal, wood, plastic, etc.

SUGGESTED WOODWORKING EXPERIENCES

Industrial Arts in Elementary Teacher Preparation

Woodworking in the laboratory should provide practice in using appropriate tools and materials as well as developing some teaching aid or activity, that an elementary teacher may use in the classroom. The following suggested activities may be accomplished by an individual or by two or three young people working together. The suggestions below are not meant to limit your selections as they are only a few of the possibilities. In constructing any of these projects, one should seek to show the application of this activity or teaching device in an elementary classroom.

1. Puppets. A puppet show may be used as a culminating experience for teaching unit. Such a show might be based on the dramatization of ideas of safety, health, conservation, and/or child literature.
2. Puppet Stage. It should be designed to dismantle or fold easily for transporting and storing. Attaching the wings with small butt hinges will provide for this.
3. Frame Weaving. A square frame with nails set in can be used in the lower grades for simple over and under weaving. This will provide a device for teaching the rudiments of making cloth.
4. Waffle Weaving. A square frame with nails set in is used to wind thread around. The points of crossing are then tied to hold the thread in position.
5. Loom for Weaving. Simplified looms may be constructed with two or four harnesses to do very fine hand weaving of patterned cloths. The activity may be simplified for the slower children or serve as a challenge for the gifted.
6. Easel. The children may use this for writing, drawing, or painting.
7. Bulletin Board. A wooden frame may be made with chalk, tack, or crayon board inserted. The frame can then be mounted on the wall.
8. Serial Box. The box has a rectangular opening on the large face. Pictures are made and mounted on a roll of paper so they can be would in front of the opening like a series of projections.
9. Illustrate a Unit. Two or more students may assume the role of elementary students performing a unit activity. The main purpose is to stimulate activity work in a unit of study such as transportation, safety, community helpers or manufacturing.
10. Mass Production. Eli Whitney and Henry Ford set the pattern for the mass production system of modern industry. A very simple object could be produced in quantity to illustrate the planning, personal organization, production, cost accounting, and distribution carried on by industry.

11. Use of Salvaged Materials. Orange crates, tin cans, corrugated boxes, and scrap wood may be used for construction by elementary children. Experimentation with a number of such materials will readily reveal many possible applications.

12. Scrapbook. A scrapbook with wood covers hinged to open easily and bound with leather thongs is durable enough to withstand the wear of usage in an elementary classroom.

13. Plaster Casting. Plaster of Paris may be cast in wooden or permaplast molds and then decorated to make wall plaques, trays, figurines, or tea tiles.

14. Handbag Handles. Wooden handles may be constructed for cloth handbags. Buttons or buckles may also be carved from wood.

15. Shoes. Beach or shower shoes may be cut from wood with canvas or leather used for straps.

16. Teaching Aids. Numerous demonstration devices are possible such as a clock, fraction boards, a thermometer, an abacus, color charts, an electrical question board or a weather vane.

17. Rhythm Instruments. A number of such instruments are possible such as rhythm sticks, a rattle, sandpaper clocks, a metal chime, a tambourine, or drum.

18. Bird Houses or Feeders. These projects may provide an interesting way to identify a variety of birds when maintained by an elementary classroom.

19. Animal Puzzles. Lower Elementary grade children find a number of brightly painted animals in puzzle form a challenge as well as educational.

20. Water Wheel. Either an over shot or under shot model might be constructed to illustrate this means of harnessing water power.

21. State Product Map. Such a map might well be laid out on a piece of thin plywood with appropriate symbols and labels locating various state products.

22. Clothespin Animals. Clothespins can be glued together and decorated with felt or other fabrics to create a variety of animals.

23. Observation Planter. A rectangular box may be constructed to serve in germinating seeds and growing plants.

24. Toys. This might include doll furniture, a paddle-wheel boat, a covered wagon, a truck, steam engine, airplane, a kite or a ring toss game.

25. Animal Cage. A combination of wood framing and hardware cloth is usually employed. The appropriate size is determined by the size of the animal for which it is designed.

26. Art Supply Box. A box or tray may be designed with a number of divisions for such things as crayons, water colors, and brushes. This might prove useful in the elementary classroom for transporting and storing materials.

27. Insect Mounts. A number of small mounting boards serve as a good means to display a variety of insects.

28. Ant Tray. An enclosure with glass sides allows the pupils to observe an ant colony at work.

29. Simple Machines. Small labeled illustrations on a display board can identify several simple machines which have increased man's physical poweress.

30. Pin Hole Camera. This camera may be constructed quite easily by using a small light tight box with a small aperature cut in a piece of sheet metal for the lens.

31. Sundial. Pieces of plywood can be fastened together so that the sun's shadow will strike the base piece. The base may have a variety of clock faces from which sun time can be determined.

32. Periscope. Thin pieces of wood can be used to construct a square column-like structure with short right-angle projections on opposite ends. Mirrors should be mounted at 45 degrees inside the intersection of the main column and the projecting ends. The reflection of an image from one mirror to the other will expand children's concept of light.

33. Insect Net. By bending a heavy wire (No. 9 gauge) around a sturdy container, approximately 12" in diameter, a net frame can be formed. Attach this frame to a 5/8" dowel rod 36" long. Fasten a cone shaped net material, such as an old curtain, to the frame. This educational aid will provide added interest on nature excursions.

34. Wooden Dominos. Large dominos (2" x 4" or 3" x 6") can be constructed with scrap pieces of 1 inch lumber. Children enlarge upon their number concepts by drilling shallow holes or just painting a different number of dots.

35. Plywood Calendar. A piece of 1/4" plywood approximately 18" x 24" will provide the backing for a calendar. Children can maintain a current calendar by attaching screw hooks in the appropriate places and then attaching the appropriate month as well as the date numbers. The names of the months plus the dates may be placed on separate small pieces of thin plywood.

36. Health Train. Blocks of wood 2" x 2" x 5" with wheels cut from a broom handle will simulate a train. Adding the name of one of the seven basic foods to each car will establish a train with the health emphasis.

STUDY GUIDE: INDUSTRIAL ARTS FOR GRADES K-6*

Chapter 1

1. How do industrial arts activities help achieve the goals of elementary school education?
2. What two purposes were to be served by the early attempts to use industrial arts at the elementary school level?
3. Discuss briefly the contributions of the following men in promoting the use of industrial arts at the elementary school level: (a) Felix Adler, (b) John Dewey, and (c) Frederick Bonser.
4. Trace the change and progress in concepts or purposes from the mid-nineteenth century to the present.
5. List several terms which are often applied to industrial arts work in the grades. Note that most of these terms are descriptive of different contributions or different emphases in industrial arts. Select two or three which seem appropriate to describe industrial arts work as you understand it.
6. List, in what you consider the order of their importance, at least six contributions which industrial arts activities make to the learning process in the elementary grades.
7. What is the role of the consultant or specialist in elementary school industrial arts?
8. List several characteristics of children which have particular pertinence in utilizing industrial arts activities to promote learning, growth, and development. Consider separately (a) physical characteristics, (b) intellectual characteristics, (c) emotional characteristics, (d) social characteristics.
9. What is meant by the term "self-contained classroom"?

Chapter 2

1. List five possibilities in arranging for a place to work (activity facility) for elementary school industrial arts.
2. Which arrangement or arrangements would appear most desirable to you as a teacher in a self-contained classroom?
3. List five criteria for selection of a suitable work bench for the elementary classroom.
4. What height bench is recommended for (a) Kdg. and Grade 1, (b) Grades 2 and 3, and (c) Grades 4, 5, and 6?
5. List the tools which you think would be necessary for classroom use in the early elementary grades. In the later elementary grades.
6. What are several points or principles which should be considered in developing a classroom tool storage system?
7. Name three soft woods suited to use in elementary grade industrial arts.
8. What thicknesses and widths of boards are most commonly used?
9. What are the solvents or thinners used with each of the following finishes: shellac, oil paints, enamel, varnish, lacquer, rubber base paints?

*Gerbracht, Carl, and Babcock, Robert J. Industrial Arts for Grades K-6. Milwaukee: The Bruce Publishing Company, 1959.

10. How are the grit sizes of ordinary sandpaper (flint paper) designated?

11. What does the term "penny" (d) stand for when ordering nails?

12. Sketch heads and name three common types of nails.

13. Sketch heads and name three common types of wood screws.

14. Define a board foot of lumber.

15. Write a formula for figuring the cost of a board. What would be the cost of a board 1" thick x 6" wide x 12" long @ 40¢ per board foot.

16. Sketch a floor plan for a classroom industrial arts activity center.

Chapter 3

1. List several possibilities for industrial arts resource people for the classroom teacher who is relatively inexperienced in the use of tools.

2. What saw or saws should be used to cut (a) straight across grain, (b) straight with the grain, and (c) curves or irregular lines? Why?

3. Should the teeth on a jigsaw blade point up or down? Why?

4. What tool is commonly used to cut light weight sheet metal?

5. What size hole will be cut by an auger bit which has a number "4" on its shank?

6. Would you use a hand drill or a brace with an auger bit? Why?

7. What are some advantages in using a sandpaper block when sanding?

8. List five points which should be kept in mind when using a file.

9. What precautions should be taken when planing end grain?

10. Where should a hammer handle be gripped for efficient nailing.

11. List two advantages of wood screws over nails as fasteners?

12. How does a bolt differ from a wood screw?

13. What is involved in preparing a wood project for a transparent finish?

14. Of what use is a drop-cloth in finishing?

15. Why is planning with the children important in industrial arts activities?

16. How would you proceed with early elementary school children in planning construction of an animal cage? A panorama or table problem?

Chapter 4

1. Indicate the grade or grades in which you intend to teach and list possible child industrial arts activities or projects which would contribute to learning in each of the following units or areas: (a) health and safety, (b) communicative arts, (c) science, (d) music and the arts, and (e) social studies.

2. Describe how you would plan and carry through, with a third grade class, a unit on "Our Community" or "Neighborhood Facilities", using as many industrial arts activities as seem desirable.

3. Develop a unit of instruction for sixth graders which is industrially oriented that should have inherent child interest. Place yourself in the position of the child and plan, with the class, to expand their understanding of this part of the environment.

A UNIT ON COMMUNICATIONS

Major Concepts

1. Communications may be conveyed by many means. Some historic methods are: runners, smoke signals, drums, lighthouses, bells, town criers, and carrier pigeons.
2. Picture-making goes back to primitive man who first sketched pictures in the soil with a stick. Pictures which were made on the walls of caves are in evidence to this day.
3. Symbolic writing has evolved through the ideographic and phonic characters of many alphabets. The many nuances of any language provide a challenge.
4. Man has learned to make pictures and to write on such materials as clay, wax, papyrus, parchment, stone, and modern papers.
5. Technological apparatus which are employed in communications include such devices as the telephone, telegraph, cable, radio, television, and satellite.
6. Visual communications, to be effective, require esthetic and practical qualities of eye appeal, legibility, simplicity, harmony, variety, and unity.
7. Man continually improves his means of communication and devises new means. One fundamental world-wide problem is to communicate meaningfully with one another.
8. A large volume of mass-communication confronts man in advanced societies. Selective perception operates to protect the individual's psyche.

Suggested Activities

1. Identify any historical means of communication used in your community. What message is conveyed by the smoke resulting from burning leaves?
2. Collect a number of pictures which are simple and tend to convey a single message. Which ones carry a unique message for you?
3. Enumerate a number of symbols that you are familiar with, other than the alphabet and numbers. Are symbols used for traffic safety? If yes, what are some of these?
4. Prepare a piece of parchment by processing an animal skin. Is parchment used today as a surface on which to write?
5. Make paper in the classroom by the reduction of old paper to pulp, bleach it, and mold new sheets. Is it possible to do relief printing or to write on it?
6. Prepare a bulletin board display explaining the major steps in the production of paper. What visual communication principles should be considered?
7. Construct a model telegraph set which employes a dry cell as a power source. What is electro-magnetism? How does the telegraph work?
8. Build a tin can and string telephone set for use in understanding the telephone. How do the sound waves travel from one can to the other?
9. Fabricate a number of different rhythm instruments to be used in the study of music. Are the sounds which can be produced a means of communication?
10. Construct an electrical question and answer board. What means of communication is employed to give the learner immediate feedback as to whether the correct answer or an incorrect answer has been chosen?

A UNIT ON CONSTRUCTION

Major Concepts

1. Construction is a major industry which produces private and public housing, commercial buildings and such structures as bridges, tunnels, stadiums, and industrial applications of many forms.
2. Construction may take place either on-site or off-site (pre-fabricated).
3. Climate partly determines the type of living units constructed.
4. The quality of the structures erected is influenced by the resources of the geographic area.
5. Workers do specialized tasks which make the building operation more efficient.
6. Many specialized tools, materials, and machinery provide for greater efficiency.
7. The large, expensive road construction equipment, plus the skills to use it, have made our extensive inter-state highway system a near reality.

Suggested Activities

1. Explore the community to determine what construction projects, if any, are in progress. Report back to class the nature of the project(s). Are the endeavors private or public? Is the work in progress related to housing? Are there examples of commercial or industrial structures being constructed?
2. Survey the community by taking pictures to record the various materials which are being used. Can you determine why a given material is used in a number of different applications?
3. Examine a few buildings which are under construction to determine what material(s) are being used for insulation. Why is insulation desirable? How does it accomplish its purpose?
4. Find out what proportion of the materials used are native or imported. Generally, which would be more expensive? Why?
5. Observe and identify some of the many occupations identified with the construction industry. What is meant by seasonal work? What are the advantages of being a construction worker? What are the requirements?
6. Collect pictures of examples of construction in a number of places in the world. Why do the materials used, means of doing the job, and the finished structures differ to such an extent?
7. Construct models of housing units representative of various cultures or parts of the world. Food and clothing are two of the basic needs of man. What is another basic need of man?
8. Construct dioramas or panoramas depicting some of the things you have learned concerning the construction industry. How does this large industry affect your everyday life?
9. Fabricate some simple cardboard structures to illustrate different roof styles used in designing buildings. What advantages do the different styles and geometric forms have?
10. Develop some illustrative structures to show examples of industrial construction. These might include frameworks for conveyance systems, lift devices, and/or wide-span unsupported roofs.

A UNIT ON MANAGEMENT

Major Concepts

1. Management is fundamentally related to working with and through the dynamic, creative human element.
2. The greatest single resource of any nation in the world is the human component.
3. Creativity, or the ability to do innovative thinking, is high at the pre-school age and during childhood. It diminishes under influences such as peer group pressure and the expectations of parents and teachers.
4. An industrial-type personnel organization is employed to fix responsibility, to establish lines of communication, promote efficiency, and to foster the harmonious completion of small and over-all tasks.
5. Incentives are those factors related to constructive endeavor which provide the worker with desires to be more productive or to do a "better" job.
6. Industrial psychology is partly based upon a realization that the money earned is only one work incentive. Other employment related perceptions may provide incentives to be productive or encourage lethargy.
7. A firm moral conviction concerning the dignity and worth of the individual is essential in effective personnel relations. This leads directly to a propensity to promote the development of employees to their maximum potential.
8. Generally speaking, many employees lose their jobs or leave them voluntarily because of an incapacity to get along with other employees rather than an inability to do the work or finding the responsibilities distasteful.

Suggested Activities

1. Determine if any of your classmates have parents who are managers in industry. If so, do the kinds of responsibilities they have differ? Would it be possible to have a parent speak to the class?
2. Collect a number of natural resources and label them neatly. Are you able to categorize a number of these so that they are more easily remembered?
3. Prepare construction paper illustrations to accompany a "tell the tallest tale," contest. Were you and your classmates creative in this endeavor? Do you think older boys and girls would be more creative in this exercise?
4. Identify some desirable characteristics of leadership and followership which seem to make sense to you. Can you identify some ways in which you might learn more about it? With whom might you discuss this?
5. Learn as much as you can about the personnel organization of your elementary school. Can you chart this on poster board? Who has the responsibility and authority to administer your particular school building?
6. List on the chalk board as many work incentives as possible for individuals in your class during an industrial arts activity period. Do these incentives apply, to a similar degree, to each and every class member?
7. Identify some people who you feel accomplished something noteworthy in their lifetime. Can you identify their accomplishment(s) such as what they invented, developed, or wrote? How do some of these contributions affect your life?

A UNIT ON MANUFACTURING

Major Concepts

1. Manufacturing refers to the processing or fabricating of materials into useful products. Man processes, fabricates and/or changes the form of materials to increase their value.
2. The basic ingredients for manufacturing include such items as: (1) innovative ideas and technological knowledge, (2) processes, (3) tools, and (4) raw or partly processed materials.
3. The processes employed are based upon a number of scientific principles. Technology and industry adapts a large amount of the basic sciences.
4. Product design involves both function and esthetics. Consumer appeal is essential for quantity consumption which is coupled with quantity production.
5. Modern manufacturing is a basic part of our culture. Quantity production produces goods efficiently, thereby, reducing unit product cost. This low unit cost makes a multitude of goods available to a large segment of our population.
6. Technology is the basis of producing a large volume of goods and services which include food, clothing, shelter, transportation, tools, and utensils.
7. Manufacturing started with the efforts of primitive man. Other stages in its evolution include the domestic system, craft guilds, industrialization, automation, and cybernetics.
8. Cybernetics is a term used, in part, to make a comparison between the self-regulating nature of computer controlled machines and the complex self-control nature of the human nervous system. The computer controlled machine fails every time, however, if the need for making a sound value judgment arises.
9. Quantity production is based on a number of practices that promote efficiency which include the use of (1) technological knowledge, (2) innovative ideas, (3) specialized tools, machines, and skills, (4) a division of labor, (5) complex conveyance systems, (6) aggressive research and development, (7) close tolerances to provide for the interchangeability of parts, (8) automation, and (9) cybernetics.

Suggested Activities

1. Prepare a list of manufactured articles within your classroom. Which ones are hand-made?
2. Identify some factories which are situated in your geographic locality. What do these plants produce? What materials are used?
3. Collect a number of samples of manufacturing materials which are used in your locality. Are some raw and others partly processed?
4. Determine the differences among tools, machines, and machine tools. Why is a screwdriver a tool? Why is a pencil sharpener a machine? What tasks are machine tools designed to accomplish?
5. Process some raw materials into useful finished products. Are some materials more readily processed than others in the elementary school classroom?

A UNIT ON POWER

Major Concepts

1. Power, as man's energy source, is obtained from varied means including: (1) biological, (2) chemical, (3) electrical, (4) gravity, (5) nuclear, (6) solar, (7) water, and (8) wind.
2. Man uses power to do many kinds of work to save on human and animal energy.
3. A large number of power sources are employed in such industries as: (1) communications, (2) construction, (3) manufacturing, and (4) transportation.
4. Wind was one of the early sources of power to be harnessed by man. The windmill is still used to raise water in many parts of the world.
5. Gravity is employed in such items as clothes chutes, grain elevators, industrial sorting and conveyance systems, and pillar drivers.
6. Chemical action is responsible for the power resulting in a dry or wet battery cell.
7. Electrical energy can be produced mechanically by passing a conductor through a magnetic field or by holding the conductor stationary and moving the magnetic field.
8. Solar energy can be used to heat buildings. Some variables include: (1) latitude, (2) climate, (3) adjustable heat gathering cells, and (4) cost of installation.

Suggested Activities

1. Take pictures of a windmill or locate some in old magazines. The power generated was used for what purpose?
2. Construct a model of an undershot or overshot water wheel. What sources of power are involved? Is friction a factor?
3. Build a model paddle wheel boat powered by a rubber band. What factors affect the propulsion of the boat.
4. Fabricate a model CO_2 rocket to be used on a wire suspended across the classroom. How does it work?
5. Cite several examples of power sources that are being used in industry. Proportionately, how does the amount of human or animal energy compare to the amount of energy derived from other power sources?
6. Design and fabricate a steam powered rotor. Is steam power used extensively presently?
7. Display, in chart form, some of the highlights in man's quest to harness power of various forms. Which historical fact is most interesting to you?
8. Consider which power sources can be illustrated with actual models. Could you or your classmates bring in some examples?
9. Explore the possibility of visiting a hydro-electric power plant. What other power sources are used to generate electricity?
10. Conduct competitions using model cars, boats, and/or airplanes. Which is the most interesting to you?

A UNIT ON TRANSPORTATION

Major Concepts

1. Man has always found it necessary to transport or carry things. Primitive man had to carry food, clothing, as well as shelter, if he was nomadic.
2. Many people have spent their lives inventing easier and more efficient ways of transporting various goods over land and water, through the air, and through space.
3. The means of transportation have changed rapidly, making the world a much smaller place to live, particularly in terms of time and pecuniary interests.
4. The distribution of people and industries has made adequate transportation an essential part of everyone's life. Workers today travel as much as fifty miles or more to and from work each day.
5. As all types of traffic increases, rules and regulations must be imposed so that efficiency and safety can be maintained.
6. Transportation routes usually follow natural terrain or paths. This is particularly evident in mountainous areas and various waterways.
7. Efficient means of transportation have an important economic value. This is especially true in the case of shipments of fruits and vegetables and other perishable goods.
8. All people must pay taxes, either directly or indirectly, in order that streets, roads and highways can be built and maintained.
9. There are many opportunities for employment in all phases of transportation.

Suggested Activities

1. Prepare a list of transporting or carrying activities that are carried out in the home. Which are done manually? How many are done with mechanical means?
2. Take a trip to see trucks being loaded; visit a train or bus depot. How many people are involved in the loading process?
3. Visit an airport or seaport and observe boats and airplanes being loaded and unloaded. What kinds of special devices are needed?
4. Build models of wagons, boats, trains, airplanes, and space ships. What types of power does each employ? Which travels most rapidly? Why?
5. View a film or films on transportation. What occupations did you see, which were new to you?
6. Assemble a bulletin board display about some phase of transportation.
7. Draw pictures or make models showing how locks operate. What principles are involved?
8. Identify inventions which have promoted the development of transportation. Which are the most recent?
9. Find out about the work of such men as: Samuel Cunard, Robert Fulton, George Pullman, James Watt, George Westinghouse, and Charles Lindberg. In what way did each contribute to transportation?
10. Prepare a list of the different kinds or types of boats and airplanes. What affect has the jet airplane had on transportation? How does this affect our food supply?
11. List the different specialized jobs that are involved in the operation of trains trucks, airplanes, and boats. How many of your parents are employed in these jobs?

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LEARNING MATERIALS

Alco Products, Inc.
Public Relations and Advertising
Schenectady, New York 12305
A series of locomotive charts; a number of which are in color.

Anaconda Company
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Cessna Aircraft Company
Air Age Education Division
Wichita, Kansas 67201
Cessna Elementary Teacher's Kit.

The Corticelli Silk Mills. Silk: Its Origin, Culture, and Manufacture. Florence, Massachusetts: The Corticelli Silk Mills, 1911.

Creative Educational Society, Inc.
Mankato, Minnesota 56002
Packets of teaching pictures such as:
1. Science Studies, 2. Home and Community Helpers, 3. Seasons, 4. Safety, 5. My Community, 6. A Trip to the Farm

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Educational Service Publications.
University of Northern Iowa
Cedar Falls, Iowa 50613

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2. Developing An Understanding of Place Value
3. Developing the Fractional Concept in the Lower Elementary Grades
4. Developing the Use of Globes and Maps in the Elementary Grades
5. Nature Study Equipment, How to Make and Use It
6. Other titles available.

E. J. Du Pont De Nemours and Company
Public Relations
Wilmington, Delaware 19800
This is DuPont Series: free

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F. A. Owen Publishing Company
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5. Community Life
6. History of Aviation
7. Lumbering
8. Modern Airplanes
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11. Story of Printing
12. Transportation

Encyclopaedia Britannica
Educational Corporation
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Teaching guides such as:
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5. Light, 6. Sound

Firestone Tire and Rubber Co.
Educational Aids Division
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Akron, Ohio 44317
1. Rubber. 1960. 31 pp. plus a filmstrip, A Class Studies Rubber, is available, one to each building.
2. Rubber and Tire Production. Flow charts.

Ford Motor Company
Educational Affairs Department
The American Road
Dearborn, Michigan 48121
1. Trails to Turnpikes, Chart 25" x 33"
2. Ford on the American Road. Wall Chart 25" x 33"
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The Garden Club of America
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New York, New York 10022
The World Around You: Our Natural Resources Educational Packet

General Motors Corporation
Public Relations Staff
General Motors Building
Detroit, Michigan 48202
Write for a list of booklets, charts, and films available to educators.

Haman, Albert C., and Eakin, Mary K. Library Materials for Elementary Science. Cedar Falls, Iowa; University of Northern Iowa, 1964.

H. K. Porter Company, Inc.
Disston Division
Pittsburgh, Pennsylvania 15200
Request one copy each of 6 large bulletin board charts on the use and care of hand saws, power saws, and other cutting tools.

Leighton Wilkie
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Des Plaines, Illinois 60016
Chart: Productivity-Creates All Economic Growth, 1961

Los Angeles City School Districts
Division of Instructional Services
Los Angeles, California 90000
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National Aerospace Education Council
1025 Connecticut Avenue, N. W.
Washington, D. C. 20036
1. Aviation Units for the Primary Grades
2. Aviation Units for the Intermediate Grades
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1. Cotton Cleanliness Classroom Chart
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National Dairy Council
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1. What Will I Be from A to Z
2. Our Bread and Butter in Pioneer Days and Today

Natural Rubber Bureau
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Washington, D. C. 20006
1. How Natural Rubber is Grown. Chart, 25" x 38"
2. Map of Malaya. 17" x 22"
3. A Product of Nature Plus Science. A chart illustrating processing and uses of rubber.

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Lansing, Michigan 48900
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Pendleton Woolen Mills
Portland, Oregon 97200
The Story of Pendleton Woolens in the Making

Public Relations Department
Hamilton Watch Company
Lancaster, Pennsylvania 17600
Time Telling and Its Importance in Our Daily Lives

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Society for Visual Education, Inc.
A Business Corporation · Subsidiary of GPE
1345 Diversey Parkway
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1. Forest Regions of the United States Map, 18" x 24"
2. How a Tree Grows. Poster, 21" x 16", in color. 3. What We Can Get from Forest Land. Chart, 28" x 40". 4. What We Get from Trees. Chart 28" x 40", in color.

United States Steel Corporation
Public Relations Department
71 Broadway
New York, New York 10006
1. How Steel is Made-Free kit, 8" x 10" x 2".
2. Making Iron and Steel-Picture Set, including Flow Chart, 16" x 20".
3. Principal Alloying Elements in Steel. 1958. 16 pp. Illustrated.
4. Wall chart: How Steel is Made. color, 35" x 45".

University of Northern Iowa, Cedar Falls, Iowa 50613
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1. Library Materials for Gifted Children
2. Library Materials for Holidays
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4. Sources of Elementary School Social Studies Materials

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